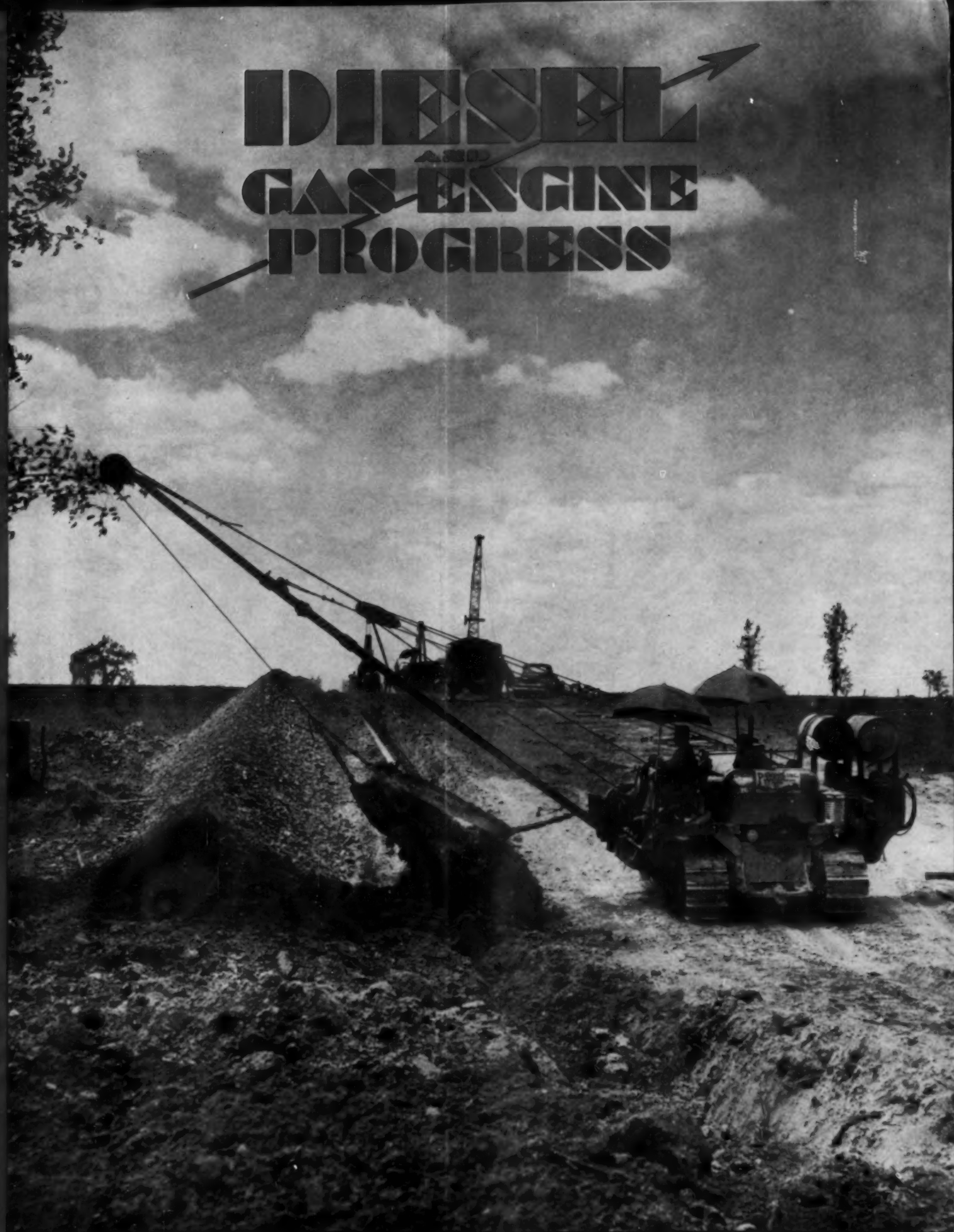


DIESEL ENGINES • DUAL FUEL ENGINES • NATURAL GAS ENGINES • GAS TURBINES

DIESEL AND GAS ENGINE PROGRESS



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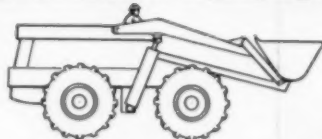
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IN FULL-POWER SHIFT TRANSMISSIONS
for equipment up to 175 h.p.

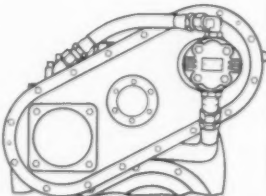
1. 4 speeds forward and reverse. All power shifted! Provides maximum horsepower to load under all load conditions.



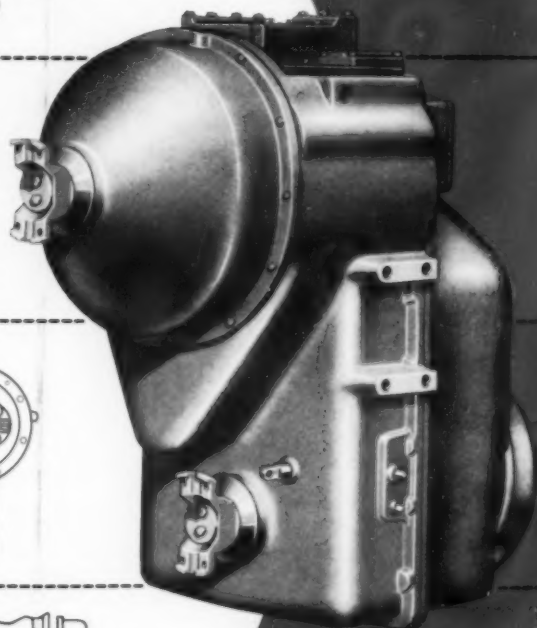
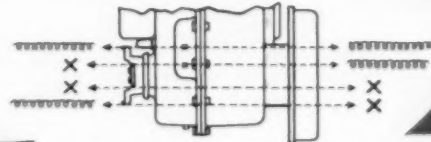
2. Integral design. Torque converter, transmission, oil passages, valving and oil pump are in one compact housing—7½" shorter than comparable models.



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Transmission and Axle Division, Detroit 32, Michigan

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This Company is digging itself into quite a hole but enjoying every minute of it. Six-hundred-thousand tons of rock are taken out of the huge Anna Quarries annually. This is no easy job because in the summer the pit is a dust bowl . . . in the winter it's a quagmire. But these diesels are delivering top performance under every adverse condition . . . with the help of Cities Service.


The Company has relied on Cities Service for 20 years. Vice President George Rippetoe states, "Thanks to Cities Service, we're getting excellent performance from our equipment. Cities Service supplies us with quality products and on-the-spot service . . . and that means 175 feet down in the ground!" Anna Quarries uses Cities Service C-300 Oil, Trojan H Grease and Trojan Gear Oil in all its diesels.

For quality products and dependable, down-to-earth service, rely on Cities Service. For more information, contact your nearest Cities Service office or write: Cities Service Oil Company, 60 Wall Street, N. Y. 5, N. Y.

ANNA QUARRIES, INC., Anna, Illinois

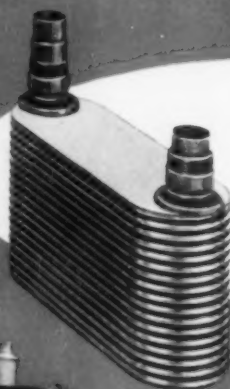


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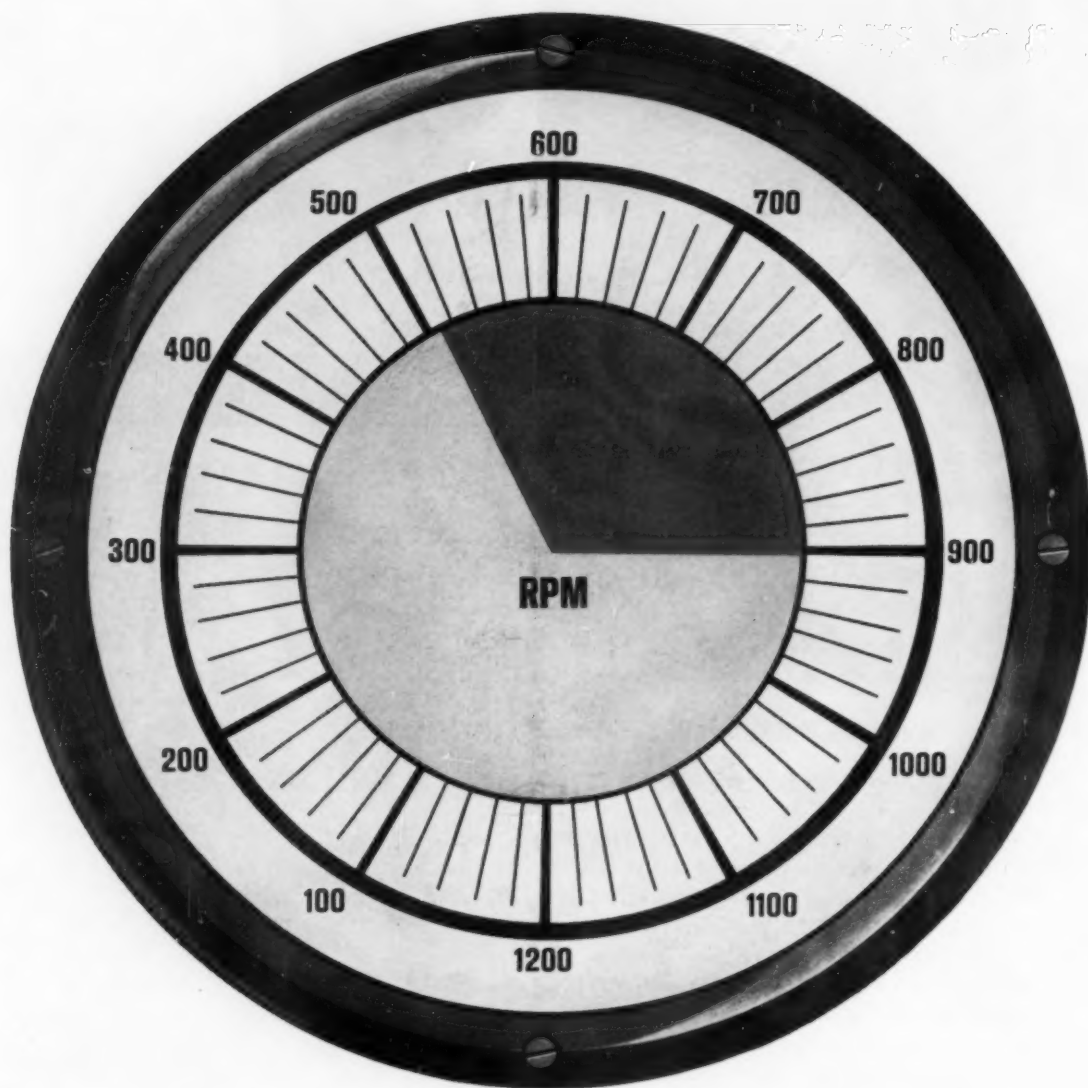
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FRONT COVER ILLUSTRATION

A-C HD-41 backfiller followed dope crew during laying of 34 in. main line, for Midwestern Gas Transmission Co., running from Emerson, Manitoba to Marshfield, Wis., last



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Seven ALCO 251 diesel electric sets for an Advanced Research Projects Agency installation in the Pacific will each generate 1500 kw at 900 rpm. Their medium speed will save about \$300,000 per unit over low-speed engines. Factors in this lower cost: suitability to mass production and pre-packaging, lower transportation and erection costs, less complexity in electrical equipment. Can you use savings like these in your stationary diesel operations? ALCO Products, Inc., Dept. 1216, Schenectady, N. Y.

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The Finest Turbocharger

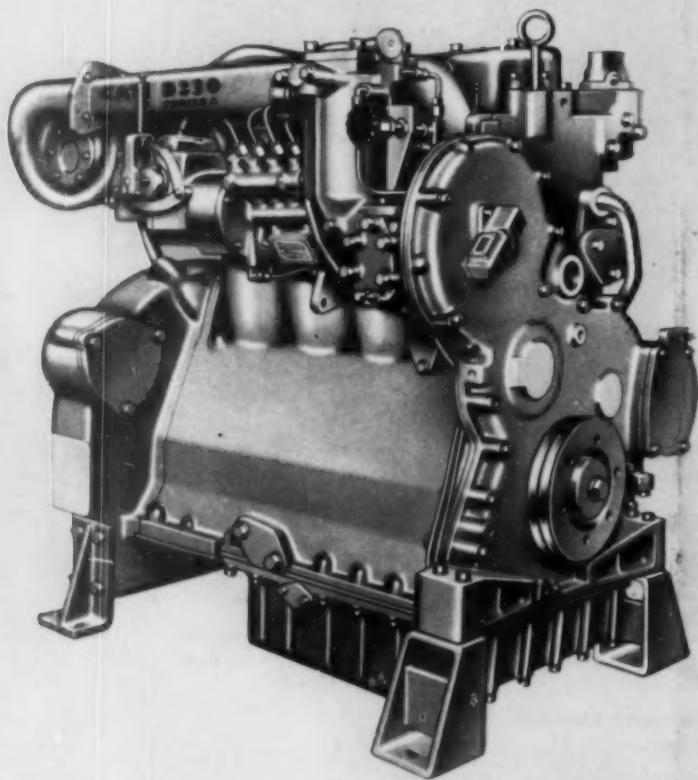


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- THREE REASONS WHY THESE
LEADING MANUFACTURERS OFFER
CATERPILLAR ENGINE POWER
IN THEIR EQUIPMENT



The D330, rated at 170 HP, is one of the new line of compact, lightweight diesel engines. With Caterpillar Engines in equipment, owners get four-cycle performance at no premium in price, plus the famed dependability and world-wide service facilities of Caterpillar.

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ENGINEERING

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THAT ONE DROP OF OIL
COULD BE THIS IMPORTANT?**



**"IMPROVE YOUR
PISTON RING
PERFORMANCE"**



SEND FOR FREE 8-PAGE BOOKLET

Write for your free copy of this technical article. Gives valuable data on improving your engine's performance and keeping it high for longer periods by better cylinder sealing. Offers practical advice on (1) how to tell whether rings should be reused or replaced, (2) choosing a ring setup, (3) relieving top ring load, and other problems. In short, it's a brief, handy guide to better piston ring performance. For your copy, write C. Lee Cook Division, Dover Corp., 940 South 8th Street, Louisville 3, Kentucky.

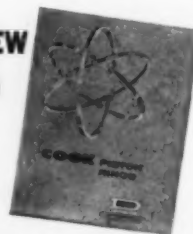
If a 12 cylinder, 2,000 HP, 330 RPM engine uses **ONE-EIGHTH OF A DROP** of additional oil per stroke in each cylinder, here's what will happen: your oil consumption will increase from 8000 BHP hours per gallon to 2000!

And that's the big reason Cook rings save you money. Like other oil control rings, Cook rings meter oil and properly spread it, but Cook rings do this in addition: *they prevent excessive use of oil!*

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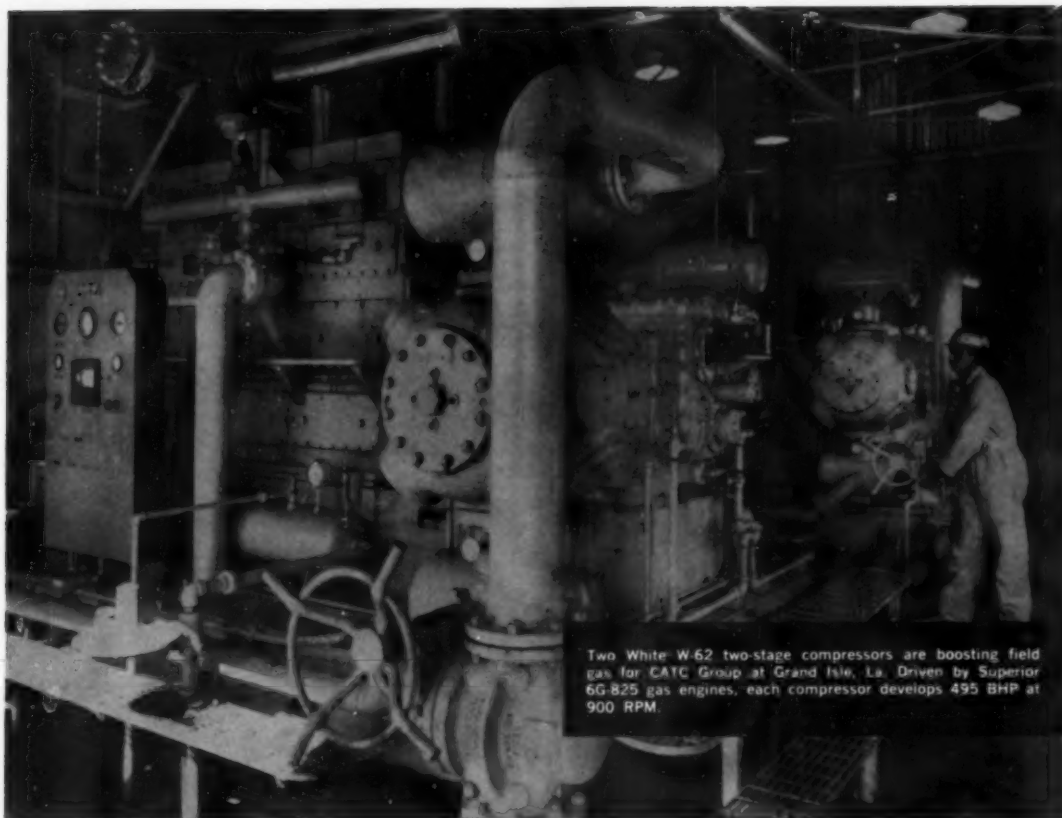
Sixteen-page catalog just off the press. Describes complete line of piston rings manufactured by C. Lee Cook Division, also the special seals and rings of the Airtomic Division. For your free copy, ask for Bulletin 610, C. Lee Cook Division, Dover Corp., 940 South 8th Street, Louisville 3, Kentucky.



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COOK**

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Two White W-62 two-stage compressors are boosting field gas for CATC Group at Grand Isle, La. Driven by Superior 6G-825 gas engines, each compressor develops 495 BHP at 900 RPM.

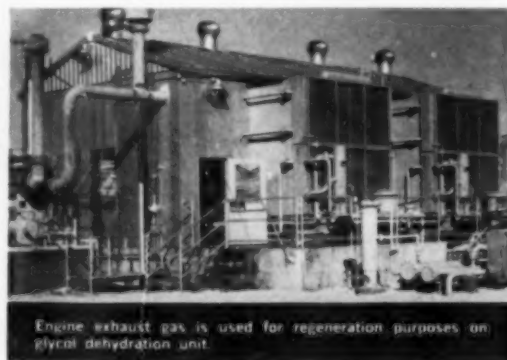
ONSHORE-OFFSHORE...CATC* Served By White/Superior Engine-Compressor Sets

Two White/Superior engine-compressors on field gas booster service for CATC Group (Continental Oil Co., Operator) will be followed by two additional units, offshore. The recent order specifies two W-64 three-stage compressors driven by Superior 8G-825 gas engines, each developing 660 BHP at 900 RPM. Job site is CATC's Block 30 offshore platform, West Delta field, off Grand Isle, La. White's is the only *matched-design*, balanced-opposed unit available in the 660 HP category. It's specially suited to offshore service because there are no horizontal primary unbalanced forces to shake the platform and disturb auxiliary equipment and instrumentation.

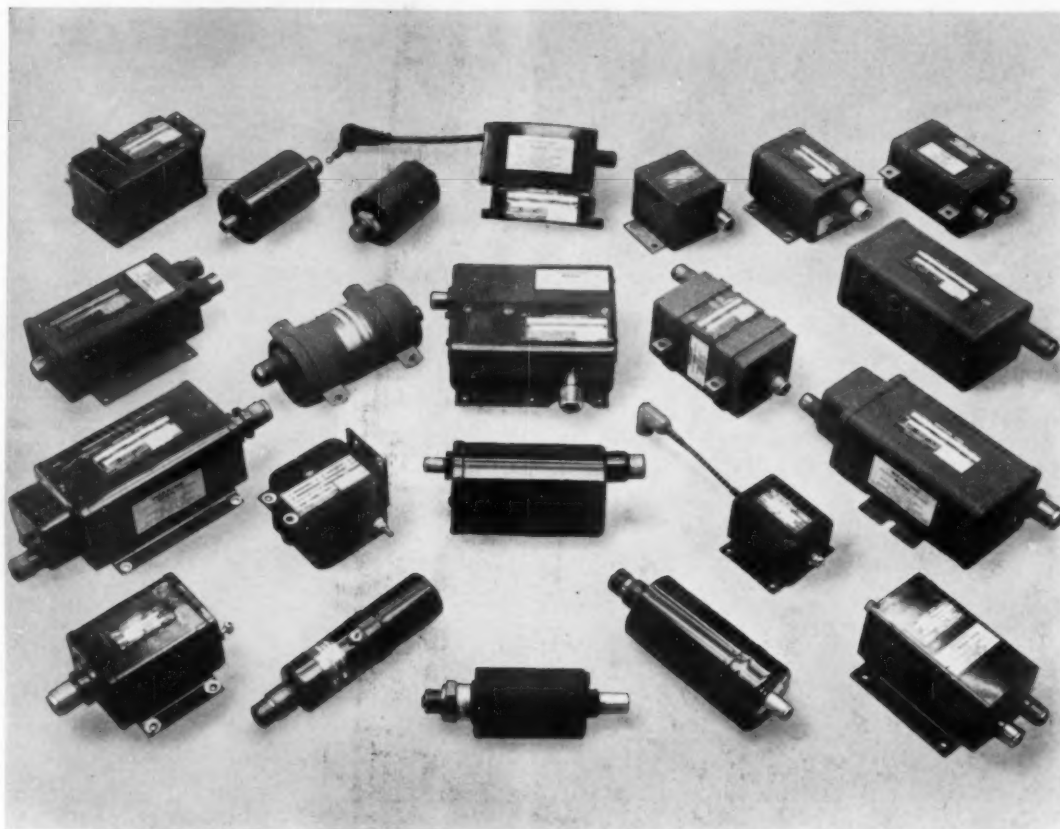
White's medium speed, heavy duty compressors—two, four and six-cylinder models, 200 to 1000 BHP—offer cylinder sizes from 4000 PSI, 2½" dia. to 85

PSI, 22½" dia., providing 68 standard cylinders. Custom sizes and designs are also available. Write for new Bulletin 124, describing compact packages for gas lifting, boosting, repressuring, peak shaving, underground storage applications, etc. White Diesel Engine Division, Springfield, Ohio.

*Continental Oil Company, Atlantic Refining Company, Tidewater Oil Company, Cities Service Oil Company



Engine exhaust gas is used for regeneration purposes on glycol dehydration unit.



BENDIX IGNITION EQUIPMENT

Tailored to specific gas turbine needs

You see here some representative members of the large Bendix ignition equipment "family" developed to meet *exact* gas turbine engine requirements.

As specialists for many years in designing and producing ignition equipment of all kinds, the Scintilla Division of Bendix is able to "tailor-make" systems that unerringly com-

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To round out the ignition "package," we also produce a full range of igniter plugs, cables, electrical wiring harnesses, and electrical connectors.

For ignition equipment that assures full-time efficiency, call us in Sidney, New York.

Scintilla Division





**"The 21000 diesel
made about twice
the shovel
out of
this machine"**

... reports the operator of a Bucyrus-Erie 54-B shovel owned by Lige Dickson Co., Tacoma, Washington. "It has lots of steady power," the operator adds — "with fast recovery and excellent lugging power."

"It's a good engine," agrees the owner. "It not only increased production, but dropped fuel consumption 40%!"

There must be something to it when user after user makes enthusiastic reports like these about Allis-Chalmers "Thousand Series" diesels. Wouldn't it pay you to find out from your dealer what they will do for you? Allis-Chalmers, Milwaukee 1, Wisconsin.



BC-38



ALLIS-CHALMERS

POWER FOR A GROWING WORLD

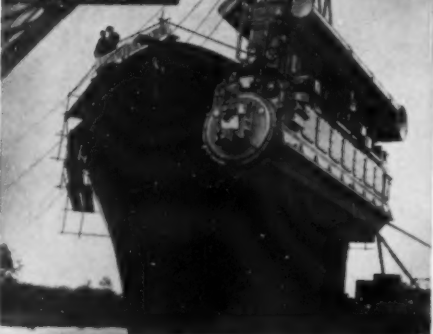
1. Michigan SS D Loaders with A 6 L 514 Deutz air-cooled diesel



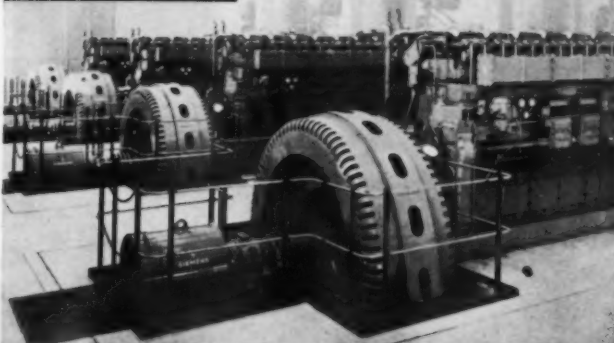
2. Iron Vulture Packer with Deutz A 2 L 514



3. 3000 BHP Deutz Diesel being lifted aboard the Ludwigsburg



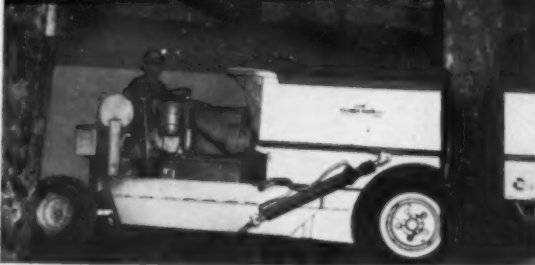
4. Deutz equipped power station at Chittagong, Pakistan



5. Wagner ore carriers and semitrailers rely on Deutz power



6. Deutz driven Young ore carrier



Dynamic Deutz Diesels are equally at home in front-end loaders, compactors, marine vessels, power plants, generators or ore carriers. There is a wide range of both air and water-cooled diesels. Unequalled reliability, rugged construction and high economy have been Deutz trademarks for over 90 years. Any diesel application problems? Send coupon!



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Lower maintenance costs: Deposits caused by excessive sulfur in fuel can damage the engine. AMERICAN PREMIER's low sulfur content means reduced engine wear. AMERICAN PREMIER's "just right" viscosity results in effective injector lubrication and the minimizing of leakage—you don't waste fuel or power.

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Fleet Men Seek Improved Equipment

A two-day meeting of the Maintenance Committee of the Regular Common Carrier Conference at Milwaukee came up with several new proposals to improve common carrier tractors and trailers, and a request for "special handling" of the failures of plastic insulated wiring. Chairman Frank Eaton, superintendent of maintenance, The Mason & Dixon Lines, Kingsport, Tenn., said he felt the meeting of 30 or more fleet maintenance directors was "very worthwhile and provides the means to solve many of our present equipment difficulties." Robert Gardner, staff engineer of the Conference, said the maintenance men have asked a joint committee of the AMA, TTMA and the Motor Equipment Manufacturers Association "to determine the specifications of wiring functionally adequate for the life of a vehicle." The failure of plastic wiring has been an unsolved equipment problem for more than a year. The engineer said the Committee discussed the lack of standard specifications for diesel fuels, and that the problem of getting an accepted "spec" will be taken up with the American Petroleum Institute. The maintenance men spent most of the first day in detailed discussions with five manufacturers of drive trains—the various mechanisms employed to transmit power from the engine to the wheels. This is the first such "closed meeting" with manufacturers on the problems of drive trains. The Maintenance Committee's next regular session is January 11-12 at Detroit in connection with the annual meeting of the Society of American Engineers. Principal subjects discussed at that time will be electrical problems of equipment and manufacturers' warranty policies. The Committee is composed of maintenance directors of companies belonging to the Regular Common Carrier Conference.

Clark Promotes Two

Two executive promotions at Clark Equipment Co. has been announced by George Spatta, president. C. H. King, vice president, formerly in charge of engineering and sales for Clark's Automotive Division, has been appointed to the newly created position of staff officer of the company, with corporate-wide responsibilities for engineering and related technical activities. He will act as consultant to the managers of Clark's five manufacturing divisions on long range technical and engineering problems. Mr. King has been with Clark since 1925. Ronald H. Bolster will assume Mr. King's duties as head of engineering and sales for the Automotive Division. Previously chief engineer for

the division, he has been with Clark 34 years.

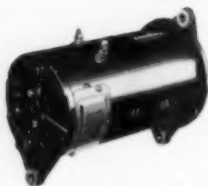
New Materials Lab

A special facility to develop new materials for aircraft, space and industrial powerplants of the future has been established by Pratt & Whitney Aircraft Division of United Aircraft Corp. L. C.

Mallet, vice president of UAC and general manager of all P&WA operations, said the new Advanced Materials Research and Development Laboratory will be directed by Dr. Maurice E. Shank, former associate professor of the department of mechanical engineering at Massachusetts Institute of Technology. Principal goals of the laboratory will be development of high-strength materials,

alloys for service at extreme temperatures and materials for energy conversion devices. New materials will be sought for a wide spectrum of powerplants, including rocket and aircraft jet systems, as well as marine and industrial engines. The laboratory, located in the North Haven, Conn., plant of P&WA, will employ approximately 30 senior scientists.

KEEP YOUR OFF-THE-ROAD



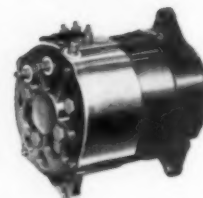
HEAVY-DUTY, LONG-LIFE D.C. GENERATOR

- Double-length, double-life brushes with constant-tension springs
- Ball bearings with sealed grease reservoirs—need no lubrication between engine overhauls
- 50-ampere maximum output—available with 10-ampere output at engine idle
- Sealed field coils—impervious to moisture and corrosion



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- Built-in silicon diodes eliminate external rectifier
- 30-ampere output at normal engine idle
- 60- or 85-ampere maximum output models available
- Ball bearings with sealed grease reservoirs—need no lubrication between engine overhauls

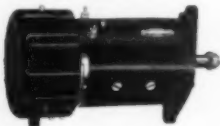


EXTRA-HIGH-OUTPUT A.C. GENERATOR

- 130-ampere maximum output
- 40 amperes at engine idle
- Three-phase a.c. voltage available—ideal for 120-volt conversion as a power source for mobile d.c. power equipment
- Ball bearings with sealed grease reservoirs—need no lubrication between engine overhauls

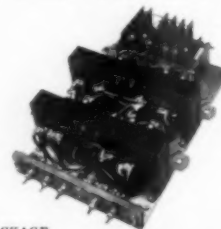
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- Totally enclosed for protection against foreign materials
- 12-volt—24- and 40-ampere maximum outputs. 24-volt—15- and 20-ampere maximum output generators available
- Double-life brushes and constant-tension brush springs
- Ball bearings with sealed grease reservoirs—need no lubrication between engine overhauls



POWER SUPPLY PACKAGE

- Rectifies and transforms vehicle generator voltage up to 120 volts d.c.
- Furnishes dependable power up to 1200 watts
- Provides mobile power suitable for incandescent lights, universal motors, d.c. motors, a.c.-d.c. radios, resistive loads without thermostats, or other 120-volt d.c. equipment



SPECIFY DELCO-REMY POWER-MATCHED ELECTRICAL SYSTEMS!

It's the sure way to prevent downtime and costly repairs caused by inadequate electrical systems. With Delco-Remy's broad line of complete systems and individual components, you can match electrical power exactly to the special needs of your

equipment. New design concepts and construction features mean Delco-Remy units last longer, require little or no periodic servicing and deliver more dependable operation under *all* conditions. The particular Delco-Remy system that'll prove

Injector Test Stand

Laboratory accurate fuel injector calibrating of large diesel engine injectors can now be accomplished at a reduction in time on the new Unitest model U-8500-1A test stand, according to Marine Pumps, Inc. Developed primarily for General Motors locomotive diesel injector calibrating, where the uniform

volumetric discharge can result in reduced fuel consumption per ton-mile, the calibrating stand is equally useful in calculating the same type engine injectors in marine and stationary service. The stand permits the checking of fuel discharged over the entire speed range of the engine, through the use of a variable speed drive between the motor and the camshaft. An electric

tachometer with an accuracy of $\frac{1}{2}$ of one per cent is one of the instruments to insure accuracy of calibration. In addition, calibrating oil pressure and temperature gauges are adjacent to the tachometer, on the vertical back panel, which also includes the automatically dumped measuring glass. The Unitest calibrator simulates actual engine operation even to the extent that when the

injector is installed in the machine the plunger spring is automatically compressed to the same timing position as when in the engine. Standard General Motors cams and rocker arms insure that the plunger acceleration and delivery characteristics match the conditions of actual engine operation. A heavy flywheel gives a steady rate of plunger travel. For more information write Marine Pumps, Inc., Division of Diesel Control Corp., 226 N. Marine Ave., Wilmington, Calif. **(ITS NEW)**

Hydraulic Actuator

The Buffalo Hydraulics Division of Houdaille Industries is producing a new line of hydraulic rotary actuators. Stocked in four basic sizes and available in a great number of design variations, the Hyd-Ro-Ac units are meeting demands for numerous commercial applications. Features for a stock hydraulic actuator are the 3,000 psi operating pressure and the unit's low internal leakage. Foot and end mountings for the standard units make them readily adaptable for many uses. **(ITS NEW)**

Bronze Parts Brochure

Johnson Bronze Co. has issued a 4 page color brochure describing Johnson's special "Continucast" process for producing bearing bronze parts. In addition to detailing why many customers are utilizing parts made from "Continucast," this brochure lists physical properties of "Continucast" SAE 660 and the wide range of other SAE bronze alloys available from the "Continucast" process. For a copy of JBL-36, address: Advertising Department, Johnson Bronze Co., New Castle, Pa. **(ITS NEW)**

Couplings Bulletin

A simplified method for selecting Flexidyne dry fluid drives and couplings for most industrial applications is featured in a new 20 page bulletin. Eight stock drives and 11 stock couplings are listed for fractional to 1,000 hp requirements, together with actual installation photographs, product pictures and engineering drawings. Included are Duplex Flexidyne couplings with higher torque capacities for given outside diameters. Ask for Bulletin No. 70 from Dodge Manufacturing Corp., Mishawaka, Ind. **(ITS NEW)**

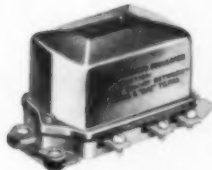
AVAILABLE NOW! The completely new 1961 edition of the **DIESEL AND GAS ENGINE CATALOG**, Volume 26, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 608 page, 10 1/2 x 13 1/2", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover and costs just \$10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG**, 10850 Riverside Dr., North Hollywood, Calif.

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DOUBLE CONTACT GENERATOR REGULATOR

- Double contacts provide better voltage control—longer service life
- Simplified external adjustment feature quickly tailors voltage to job
- Waterproofing insures long life and reliable operation



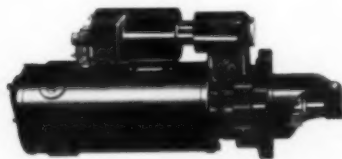
TRANSISTORIZED REGULATOR

- Vibrating type voltage sensor plus single transistor extends service life
- Accurate voltage control at all generator speeds
- Available with simplified external voltage adjustment feature
- Available for either indicator light or ammeter circuits



FULL-TRANSISTOR REGULATOR

- No moving parts to wear out
- Requires no periodic servicing
- Constant voltage control—unaffected by temperature changes, vibration or mounting position
- Simplified external adjustment feature—permits tailoring voltage to operating conditions



DC-250 HIGH-DUTY BATTERIES

- Glass mat retainers protect positive plate material—improve cycling ability, provide longer service life
- Resin seals between cell cover and terminal and between case and cell cover protect plates and separators from vibration damage and prevent electrolyte loss
- Newly formulated positive plate material withstands vibration and cycling damage—delivers dependable power during longer life span of DC-250



HIGH-DUTY CRANKING MOTOR

- New high-performance 12-v. motor eliminates need for series parallel switch circuits with no increase in battery capacity—24- and 32-volt models also available
- Two-piece housing permits 24 different solenoid positions, reduces number of models and spare parts needed
- Totally enclosed drive shifting mechanism is protected against dirt, water, slush and ice
- Heavy-duty sprag clutch remains engaged until engine starts—improves cold weather starting

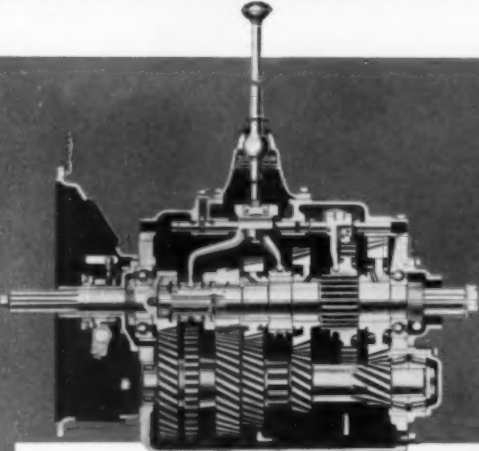
most economical for your needs depends on your equipment's job and its performance requirements. Ask your dealer about Delco-Remy power-matched electrical systems and specify them when ordering new vehicles. And, to bring your present equipment up to date, contact your United Delco Distributor.

Delco Remy

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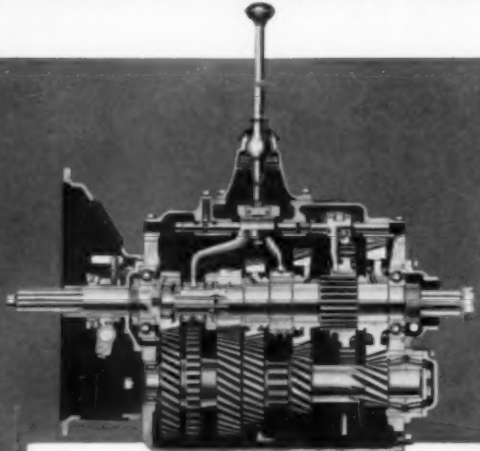
for diesel engines 195 to 250 hp
LIGHTWEIGHT... HIGH CAPACITY



Model 5-H-74 and 5-HA-74

designed for use with	GEAR RATIOS:
2-speed auxiliaries,	5th 1.00
3-speed auxiliaries,	4th 1.17
2-speed axles.	3rd 1.98
	2nd 3.61
	1st 6.60
	Rev 6.51

Model 5-HA-74—93 lbs. lighter with aluminum case and clutch housing.



Model 5-H-75 and 5-HA-75

designed for use with	GEAR RATIOS:
Fuller 4-C-75	5th 1.00
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3-speed tandem axles.	3rd 2.43
	2nd 3.91
	1st 6.60
	Rev 6.51

Model 5-HA-75—95 lbs. lighter with aluminum case and clutch housing.

- Extremely high capacity-to-weight ratio
- Ideal gear ratios
- Wide gear faces
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- Helical gearing
- Jaw clutch engaged—for easy shifting

For maximum versatility and reliability in your operation, Specify the Model . . . SPECIFY

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It means you can *meet growing horsepower needs* (without loss of existing parts inventory or maintenance know-how) merely by stepping up to the next engine in the series.

It means that all the advances of the past, present and future can be applied to *every* GM Diesel—whether it's in equipment you've had for 20 years, or one that's just off the line.

It means *the ultimate in standardization benefits*, with greater profits per engine on every GM engine you add.

No wonder so many equipment buyers specify GM Diesel power. Ask for it in your next piece of equipment.

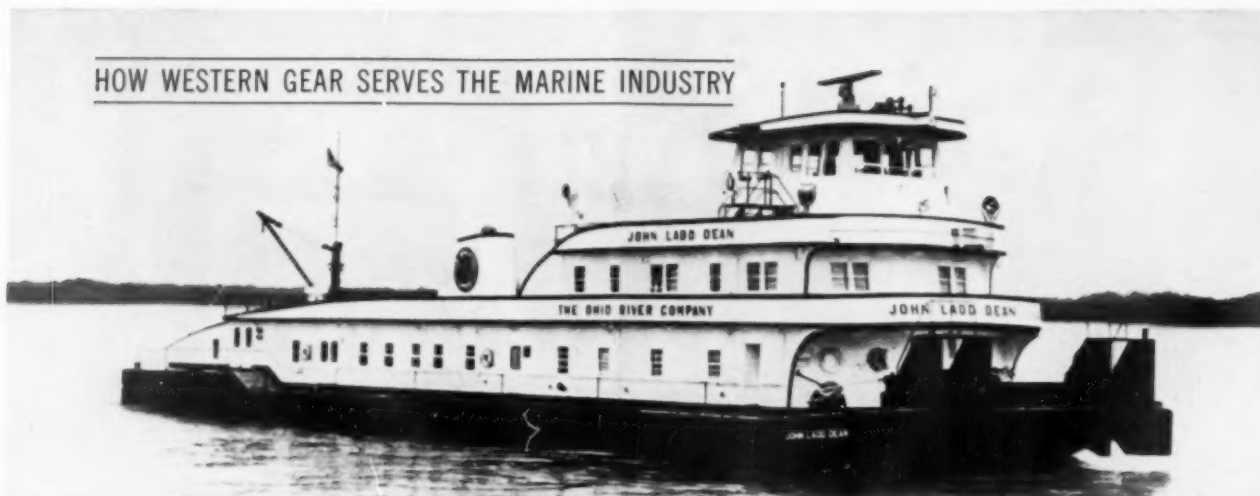
Detroit Diesel Engine Division, General Motors, Detroit 28, Michigan. (In Canada: General Motors Diesel Limited, London, Ontario.)

GM DIESEL

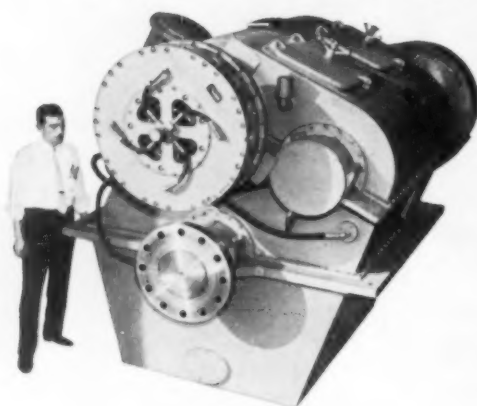
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Extraordinary
new nozzle
development

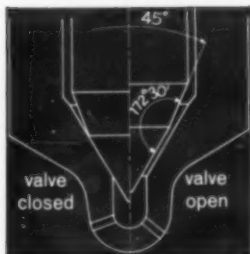


Single cone valve
after use



New double cone
valve after use

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Blue print shows new valve seating made possible
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ROSCOE, ILLINOIS

TRUCKER DOUBLES MPG-WITH "COMPACTS"

**White's New 1500D Pickup Delivery Van Truck,
Perkins' 120 HP Model 6.354D Diesel Engine
Form Team That Doubles Fuel Mileage On
Western Gillette Route Runs**

By JAMES JOSEPH

A diesel compact—Perkins' 6.354D—and a compact pickup-delivery van-truck—White's new 1500D—have teamed to hand big Western Truck Lines, Ltd. and its wholly-owned subsidiary, Gillette Motor Transport, Inc. nearly double the fuel mileage in P&D service and upwards of three-times the engine life—compared to gasoline.

Fifty of the new White-Perkins "compacts" are currently serving Western-Gillette's 48 terminals scattered thru 12 states from the west coast to Tennessee. With 50 more White-Perkins compacts on order, the trucker expects, by year's end, to have replaced nearly 20% of its system-wide P&D fleet (numbering some 537 trucks) with the dieselized combine.

Says Los Angeles shop superintendent Frank Zottarelli, "compared to the gasoline-engined P&D trucks they replace, the compacts get just about double the in-town, stop-and-go mileage. And the Perkins—on the basis of our fleet tests—seem sure to triple, and then some, the engine life we've come to expect from this type of service."

Example: Western-Gillette's first in-town White-Perkins test compact has racked up an average 12 mpg (with diesel fuel pegged about 15 cents a gallon), compared to but 6 mpg for pickup-delivery gasoline engines burning 25.5-cents a gallon gasoline.

And some of Western-Gillette's newly terminated compacts are doing even better under gruelling stop-go service—getting upwards of 15 mpg though their engines may not be shut off during an entire 8-hour P&D day.

Engineers, riding the new compacts in key Western-Gillette terminal cities, recently came up with these results:

**Delivery & Fuel Data On Western-Gillette Route-Runs
(for typical day)**

City	Miles Stop	No. Stop	Av. Stop Dis- tance (miles)	Min/Max Stop Dis- tance in Miles	Max. Payload Econ- (pounds)	Fuel Consumption MPG
Chicago	57.3	15	3.5	1.4/8.7	7427	13.0
St. Louis	50.5	15	3.34	.6/12.6	3607	14.85
Springfield, Missouri	44.0	14	3.0	.4/7.7	11,603	14.2
Kansas City, Missouri	64.9	19	3.1	1/10.0	2003	14.42
Oklahoma City	68.2	27	2.5	.5/8.8	14,515	12.65
Houston	74.0	23	2.6	.3/13.2	10,050	13.0
Dallas	75.2	29	2.5	.1/12.6	6571	12.0
Memphis	34.0	18	2.0	.1/7.2	4189	15.0

Western-Gillette's P&D fleet-wide conversion—being watched closely by truckers coast-to-coast—may shortly make the big carrier the U.S.'s "most dieselized" fleet. Currently, its more than 281 long-haul tractors (most are White Freightliners with Cummins NH-220 engines) are dieselized. So, too, its 145 mechanically refrigerated reefers (the majority are Transcold units with Perkins Four 99 diesels). Now the last "undieselized" fleet segment—in-town delivery rigs—seems destined to go diesel, too.

"The P&D conversion", concedes Jerry Kusch, maintenance foreman for P&D rigs and reefers at the Los Angeles home terminal, "came naturally from our reefer experience with the Perkins." Some reefer Perkins, says Kusch, have run 5000 hours, many of them at near idle 1100 rpm—without an hour's major shopwork. Kusch can, in fact, count the "majors" on his right hand: four needed valves ground, one, cam shaft work.

Western-Gillette roaded its first Perkins reefer

Fifty of the new White Compacts are currently serving Western-Gillette's 48 terminals scattered throughout 12 states from West Coast to Tennessee. Under the tilt-cab of the P&D truck is a Perkins 6.354D diesel.





▲ Says Los Angeles shop superintendent, Frank Zottarelli: "Compared to the gasoline engined P&D trucks they replace, the Compacts get just about double in-town, stop-and-go mileage."

► Beneath the hood of the White Compact—a Perkins 120 hp (at 2800 rpm) diesels Truck-engine combination has averaged 13.3 mpg for firm. Note C.A.V. distributor type fuel pump.

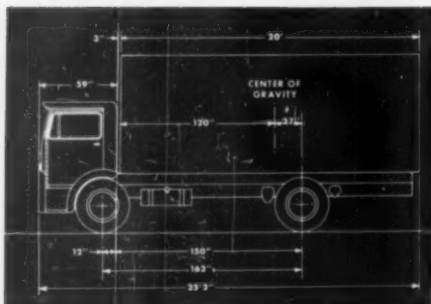
back in March, 1959. During the past 3½ years, Kusch reckons that fleet-wide fewer than 24 injector nozzles have been needed. Major reefer overhaul of the fleet's 145 reefer vans is done in Kusch's Los Angeles shop.

Western-Gillette's new White-Perkins combine teams one of in-town's widest "wheelcut" cabover tractors with one of the basically lightest (about 854-lbs.) six-cylinder diesel compacts.

The Perkins 6.354D has a 3¼ in. bore, a 5 in. stroke, a 354 cu. in. displacement and develops 120 gross hp at 2800 rpm, with a compression ratio of 16:1. It has a maximum gross torque of 260 lb. ft. Including standard accessories, fly-wheel and housing the engine scales 980 lbs. The Western-Gillette units drive through Clark 250L transmissions and Timken L145 single reduction axle.

Directly injected, the compact's combustion chambers are formed in the piston crown, the in-

Sketch shows short wheelbase, short overall length of White Compact.



jectors housed in cast iron sleeves on the left side of the cylinder head. The C.A.V. distributor-type fuel pump is vertically mounted on the engine's left side and is driven by worm gears from an auxiliary shaft. Engine speed is controlled by an hydraulic governor and the system provides an automatic advance and retard timing mechanism. Cooling is via a centrifugal water pump that's belt-driven from the crank shaft.

The engine cylinder block crank case is a one-piece, high-duty, alloy cast iron construction with the sides of the cylinder block extending below the crank shaft center line to form a stiffening skirt. Dry type renewable liners of high duty cast iron are provided with water jackets being carried down the full length of the cylinders. A water space is provided between all cylinders. The cylinder heads are alloy iron castings secured to the block by studs and nuts, a copper steel asbestos gasket being used. Two overhead valves are supplied for each cylinder. The combustion system is of the direct injection type with a toroidal-shaped chamber piston. Fuel is injected into each chamber through a 4-hole atomizer nozzle.

The crank shaft is forged from chrome molybdenum steel with seven main bearings which are the replaceable, thin-walled type, steel-backed, copper lead lined. Pistons are of high silicon aluminum alloy, fitted with three compression rings and an oil control ring above the pin and a



DIESEL AND GAS ENGINE PROGRESS

second oil control ring below the pin. The piston pins are fully floating.

Main bearings are 3 in. in diameter and provide a total effective projected area of 19.52 sq. in. The crank pin diameter is 2.5 in. and providing a projected area of 3.04 sq. inches each.

The new White 1500D (the "D" for diesel) with a 20-ft. van (all Western-Gillette's are 20-footers) can turn a complete circle in 43.7 ft., thanks in main to a 50° wheelcut in either direction—probably the widest wheelcut yet designed into a P&D compact tractor. Another reason for so extremely short a turning radius: the rig's short 150 in. wheelbase. White reports that the compact's tilt cab (but 59 in. from bumper to back of cab) permits a two-foot longer body (the 20 ft. van Western-Gillette P&D's carry, rather than the more conventional, shorter 18-footer), thus adds 128 cu. ft. to payload capacity, important for multi-stop, highly efficient (and competitive) P&D routes. White claims that six of its White-Perkins compacts can do the route-work of seven conventional trucks in the same class. As proof comes route engineering statistics from Houston, where one of Western-Gillette's new compacts began a day's run with a 10,050-lb. payload, made 23 stops, covered some 74-miles . . . and got 13.0 mpg.

Western-Gillette finds that the new White-Perkins run "clean" (they're equipped only with standard mufflers) and are generally finding favor with P&D route drivers.

"A few drivers would like a bit more speed," concedes a Western-Gillette shop man, "but most



At Western-Gillette's Oklahoma City terminal, 12 of the new White-Perkins compacts are stationed.

of the new compacts—in Chicago, for example, where we terminal a number of them—have their fuel pumps governed for 50 mph tops—plenty fast enough for town-driving."

Even governed, the diesels are keeping to former gas-engined schedule. That—and getting better clutch mileage thru governing.

"An engine," says one shop specialist, "may not be shut-off for 8 hours running . . . yet the truck may, mileage-wise, clock no more than 20 miles or so over those 8. What counts in P&D service are hours . . . not miles."

But the trucker is betting on both—miles and hours—in converting nearly 20% of its P&D fleet, system-wide, to diesel compacts. And, perhaps, all of them eventually.

Western Truck Lines, Ltd. and Gillette Motor Transport Inc. road some 1421 fleet units. Among the 281 diesel tractors are 110 dromedary units. Together, they pull some 418 vans, 145 mechanically refrigerated semis and 40 flat bed semi-trailers. With Voss Truck Lines Inc.—now operated under temporary management and control of Gillette—the fleet, which bills itself the "Sunshine Service", serves the west, southwest and midwest.

50° wheelcut in either direction gives the White 1500D units an extremely short turning radius, important for pickup and delivery service. Examining "cut" is Art McDougall, road foreman.

First Compact test rig was inspected by Western Gillette's co-owners and founders: Joe Tanzola, left, and Richard Cantlay.



ICBM IDENTIFICATION IS PROJECT GOAL

Alco 2110 HP Diesel Engines Drive Westinghouse Generators in PRESS Program Which Will Seek to Determine Whether ICBM Bodies Produce Effects From Which They Can Be Separated From "Decoys"

AN enemy missile, streaking through space, will not necessarily be a lonely object on a radar observer's screen. The missile might be accompanied by a covey of decoys designed to confuse defenders and encourage them to attack a decoy rather than the real warhead. A complex installation at Roi-Namur Island in the Kwajalein Atoll will attack this problem in a series of tests soon. The Advanced Research Projects Agency (ARPA) is installing an experimental ballistic missile defense research facility there as part of Project DEFENDER, this research undertaken under the designation of Project PRESS. (Pacific Range Electromagnetic Signature Study.)

PRESS is a program designed to investigate physical effects associated with flight of ballistic missiles from mid-course through re-entry. Immediate objective of the research is to learn as much as possible about physical interaction which takes place in flight, especially during re-entry. Eventually the program hopes to determine whether ICBM bodies (re-entry vehicles, decoys or other) produce observable effects from which identification of the body can be made. Hence, whenever

there is enough reason for doing so, attempts will be made to test specific discrimination (identification) methods. Proximity of Roi-Namur to the Nike-Zeus test installations on Kwajalein will enable PRESS experiments to use target missile and communications provided by the Zeus program.

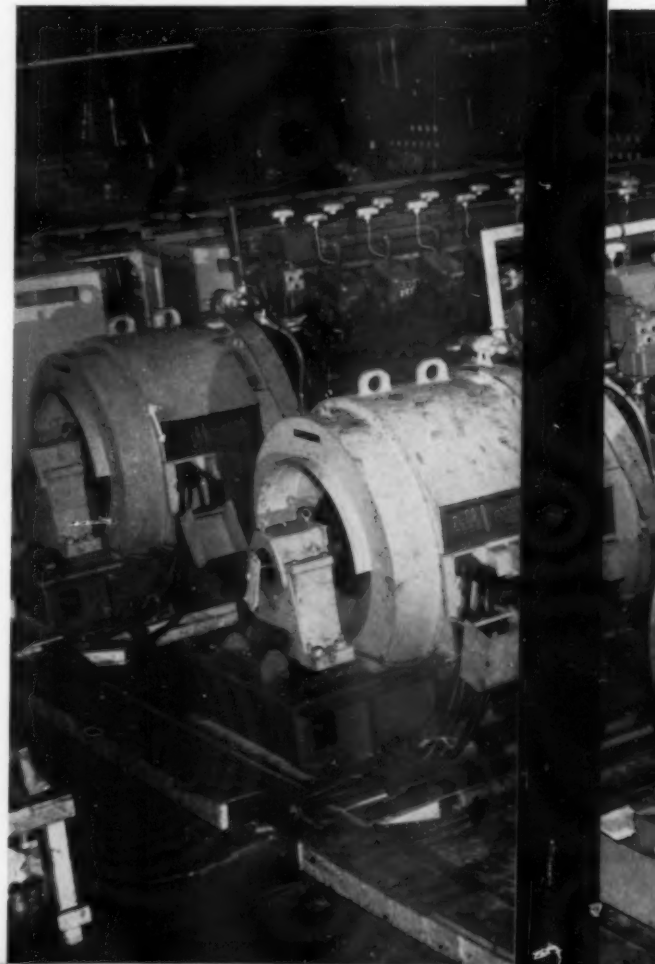
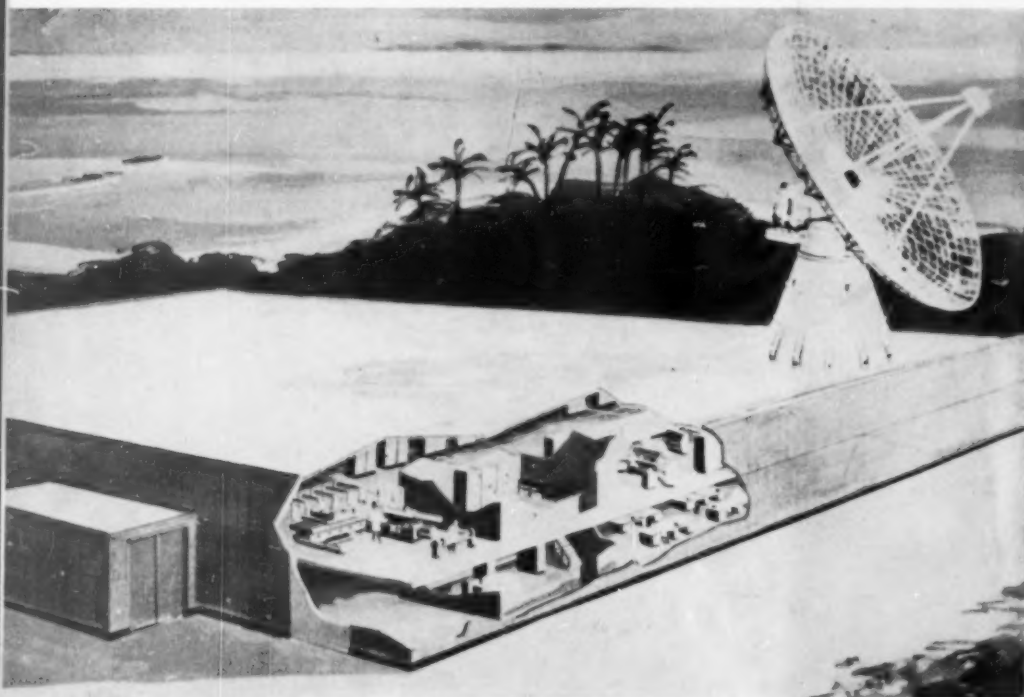
Radar Instrumentation scheduled for Project PRESS is the TRADEX two frequency (UHF and L band) being built by RCA. The radar, along with ground based optical equipment and airborne instrumentation, will be integrated into a single system by a high speed, large capacity scientific data processing facility. To provide the precise power for the complex radar and other electronics system used in the project, the Army has installed seven Alco diesel-electric generating sets on Roi-Namur. These sets were built by Alco to maintain steady-state voltage to within one-half of one per cent and steady-state frequency to within one-quarter of one per cent. This precise power from the prime source will enable the facility to realize the best capability of its sophisticated electronic components, and removes the need for complicated power regulation devices.

The seven units will supply a total of 10,500 kw of power. Each diesel-electric generating unit has a 16 cylinder, 2110 hp turbocharged diesel engine (Alco model 251) which will drive a 1500 kw, 60 cps Westinghouse generator at 900 rpm. Each engine will be capable of a 10 per cent overload if an emergency should require it. Each set, designed for continuous duty and low subtransient reactance, will have a voltage rating of 4160/2400.

The Alco units called for in the contract are of the "package" type, which means that the size and weight of each unit has been limited so that it could be moved from one remote location to another by air if necessary. Weight of each complete power generation unit (engine, generator and all auxiliaries mounted on a rigid common sub-base) is 86,000 lbs. The generating equipment cost about \$129 per kw. Each has been mounted on a "skid," which is made of "H" beams joined by crossies and a top deck. Thus the complete unit is ready to be put into place, rather than having to be assembled at the site. This construction and lighter weight also mean that a smaller, less costly foundation can be used.

Three diesel-electric generating sets for Project PRESS shown on test at Alco's Auburn, N.Y. plant. Model 251 engines (2110 hp at 900 rpm) drive Westinghouse 1500 kw, 60 cps generators to provide precise power necessary for radar, other systems of Project PRESS. Engineer adjusts Woodward governor.

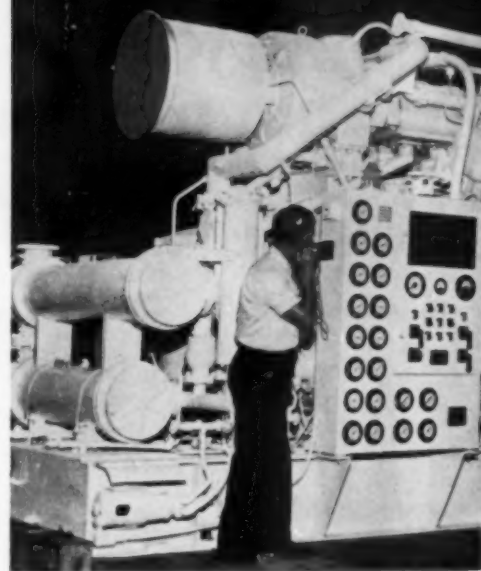
TRADEX system building on Roi-Namur will be housed in 170x180 ft., two story building. Building interior is covered with Terne metal shielding to guard against radio frequency radiation.



The function of the Army installation at Roi-Namur is to provide a means to accomplish the correlation in space and time of the outputs of large, long-range radars and of one of the more additional detectors, so that a space vehicle may be detected, tracked and distinguished from other fragments and decoys, at long ranges.

The diesel generator sets will maintain steady-state voltage to within one-half of one per cent, as compared to voltage variations of up to three per cent and frequency fluctuations of up to one per cent in its commercial diesel power plants, Alco stated. Further, in a load change of 25 per cent, for example, the Alco units will be required to recover steady-state voltage within one-half second, and steady-state frequency within one-and-one-half seconds, as compared commercially to a voltage recovery time of five to six seconds and frequency recovery in four to five seconds. During such a load change, the voltage dip of the units will be held to three per cent and the transient frequency dip to one-half cycle, as compared to a voltage dip of up to 25 per cent and a transient frequency dip of up to one to one-and-one-half cycles in commercial power. Among other factors, elimination of voltage variations is critical since such variations often show up as false readings on radar screens.

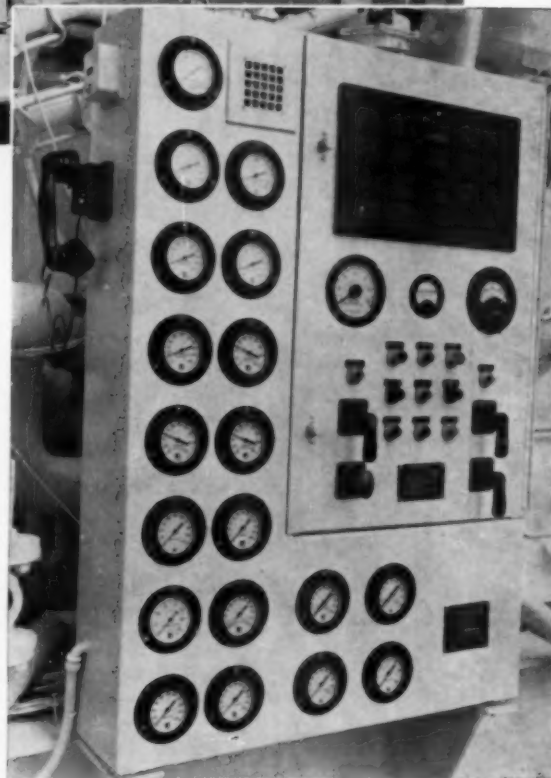
An intensive program of testing has been carried out to demonstrate that the power units will operate in the precise manner intended. They underwent more than two dozen different tests; some of the tests were standard, but a lion's share of them were special tests carried out to insure power preciseness. One of the most rigorous is the short circuit test to see if the unit can with-



Another view of the Alco sets, showing mounting of control panel, lube oil cooler, lower left, and jacket water cooler, top left. Closeup of panel at right shows Alnor pyrometer, Weston tachometer. Most of other gauges are by U.S. Gauge. Annunciator panel at upper right lights up to indicate cause of alarm.

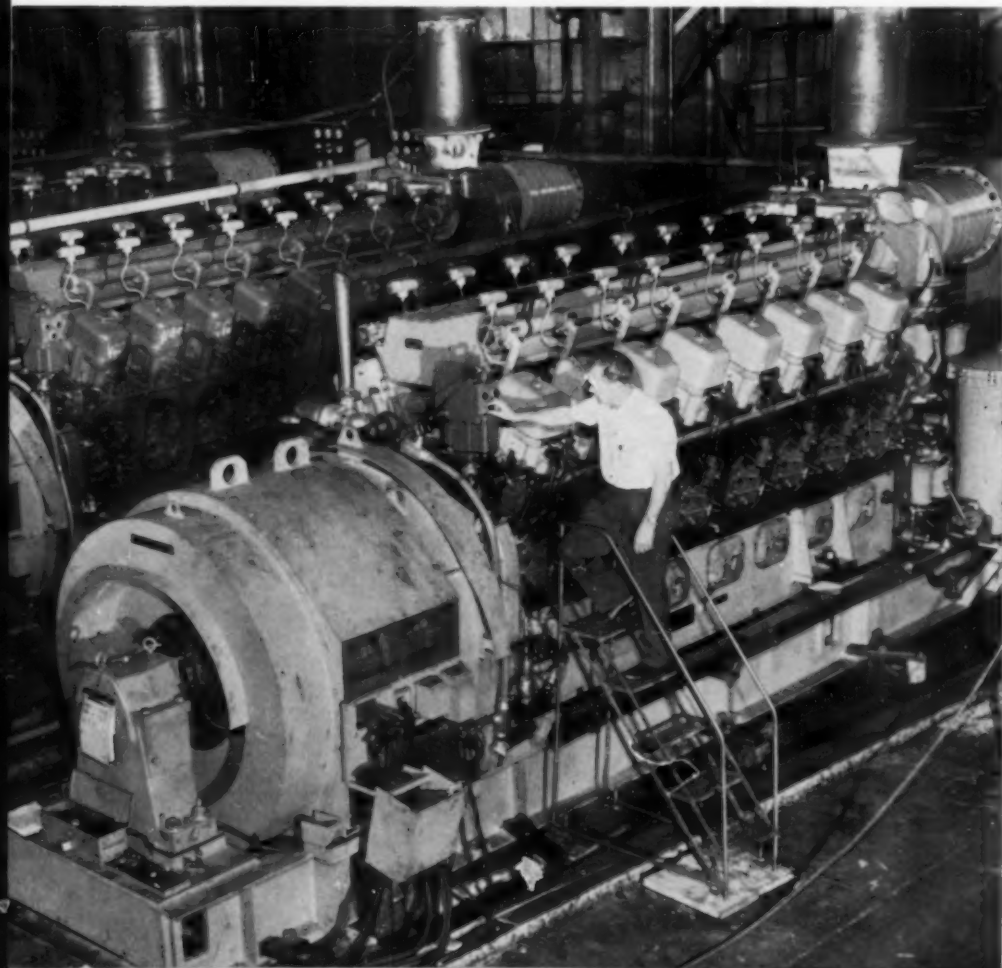
stand without damage the stresses of a 10-second, single-phase and three-phase, line-to-line short circuit at its terminals. An overspeed test for all units was carried out to confirm that they can withstand an overspeed of 10 per cent without mechanical injury.

Project PRESS is a research laboratory where



data must be collected, recorded and evaluated and with no loss of definition. For example, PRESS will be required to measure range to extreme accuracies. A precision of measurements not normally associated with weapon systems is required.

The key to such precision is a low subtransient reactance (1.1 per cent per unit), closely-regulated, electrical power system. At Roi-Namur, this low subtransient reactance will be obtained with five of the 1500 kw, 5.5 per cent subtransient reactance, power-generating units operating in parallel. The power will be supplied to the critical bus system, which in turn will supply power to the technical loads. The two additional 1500 kw generating units will furnish power for the utility loads. The very low bus subtransient reactance will assure an almost constant system voltage, even when extremely heavy loads are suddenly added to, or dropped from, the system. Such power characteristics will offer the PRESS scientist the maximum in precision measurements, and will permit him to employ the full capabilities of the newest techniques in sensors.



NEW 4100 HP TOWBOAT HAS TURBOCHARGED GM DIESELS

**Canal Barge Company's M/V *Leonidas Polk* Is
First of Her Type on Inland Waterways Equipped
With Model 567DMT Engines; Has 900 HP
Edge on Sister Vessel in Fleet**

Latest of three new towboats to go into service for the Canal Barge Co., Inc., New Orleans, the *Leonidas Polk* joins a 3200 hp near-twin, the *Ned Merrick* in the firm's fleet. Identical to the *Merrick* in construction, the *Polk* differs in one important respect: she packs an additional 900 hp in her engine room. The *Leonidas Polk* is the first towboat to be powered with General Motors Model 567DMT turbocharged, 2-cycle diesel engines on the Inland Waterways.

While both the *Polk* and the *Merrick* are identical in all features other than power the short time the 4100 hp *Leonidas Polk* has been in service has justified the decision of Canal Barge of going to the higher horsepower. The two boats were designed to handle maximum tows anywhere on the river system. They tow petroleum products, petrochemical and chemicals from Texas to Chicago via the Gulf Intracoastal Canal and the inland river system to Chicago. During a considerable part of the time both boats have been working, river

conditions have not been ideal, yet the *Leonidas Polk* has handled tows up to 15,000 tons at a rate of over two-million ton miles a day.

Like the *Merrick*, the *Leonidas Polk* was built at the Southern Shipbuilding Corp., Slidell, La., and designed by H. E. Breit, general manager of the corporation. Both vessels are 145 ft. in length with a 35 ft. beam, moulded depth of 11 ft. and a draft of 8 ft. Each has a retractable pilot house which can be lowered 10 ft. to allow them to pass under low bridges in the Chicago area.

The *Leonidas Polk* is powered with two, General Motors model 567DMT turbocharged, 2-cycle diesel engines. Each engine is rated at 2050 hp at 800 rpm driving the 4-bladed, 102 in. propellers through a 3.79:1 Falk reverse reduction gear.

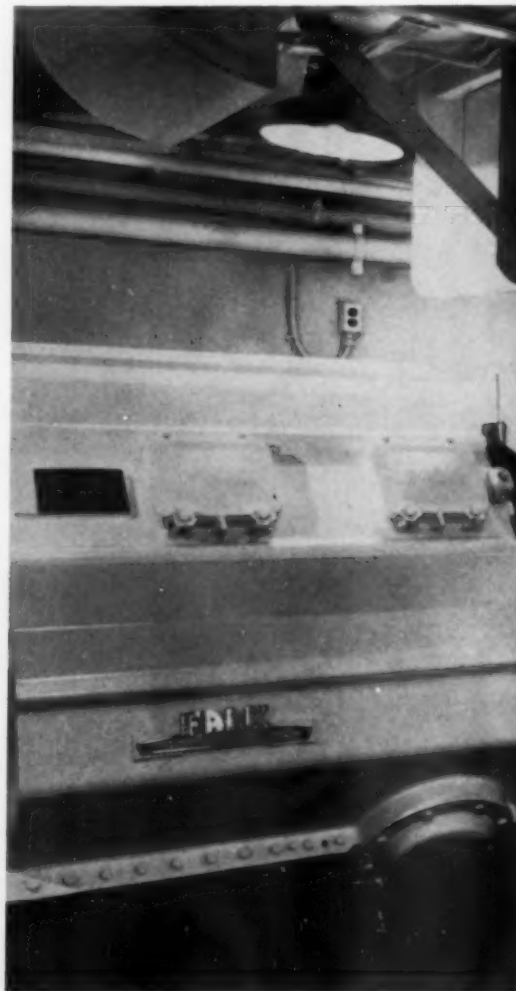
The hull efficiency was also improved in both vessels by placing a 19½ in. horizontal offset of the reduction gear. This was done by rotating a stand-

ard vertical offset reduction gear 45°. The only change in the gear was the use of a special oil pan and mounting flanges. Because of this departure from the standard installation, the wheels were moved farther apart, allowing a better flow of water. The engines were also moved inboard and lowered. This arrangement permits more fuel capacity, better working area for maintenance of the engine, and a lower meta-centric height.

While this is the first installation of the model 567DMT on a river towboat, there are more than 400 of this series engines in service for the past three years, working primarily in locomotives. The model 567C series engine was improved and added strength was built into the engine to permit turbocharging and higher horsepower ratings.

The after end of one of the General Motors model 567DMT in the M/V *Leonidas Polk*. The left of the picture shows the horizontal placement of the reduction gear to improve hull efficiency.

The Canal Barge Company, Inc. 4100 hp M/V *Leonidas Polk*, powered with two General Motors 567DMT diesel engines, with a petroleum tow above St. Louis, Mo.

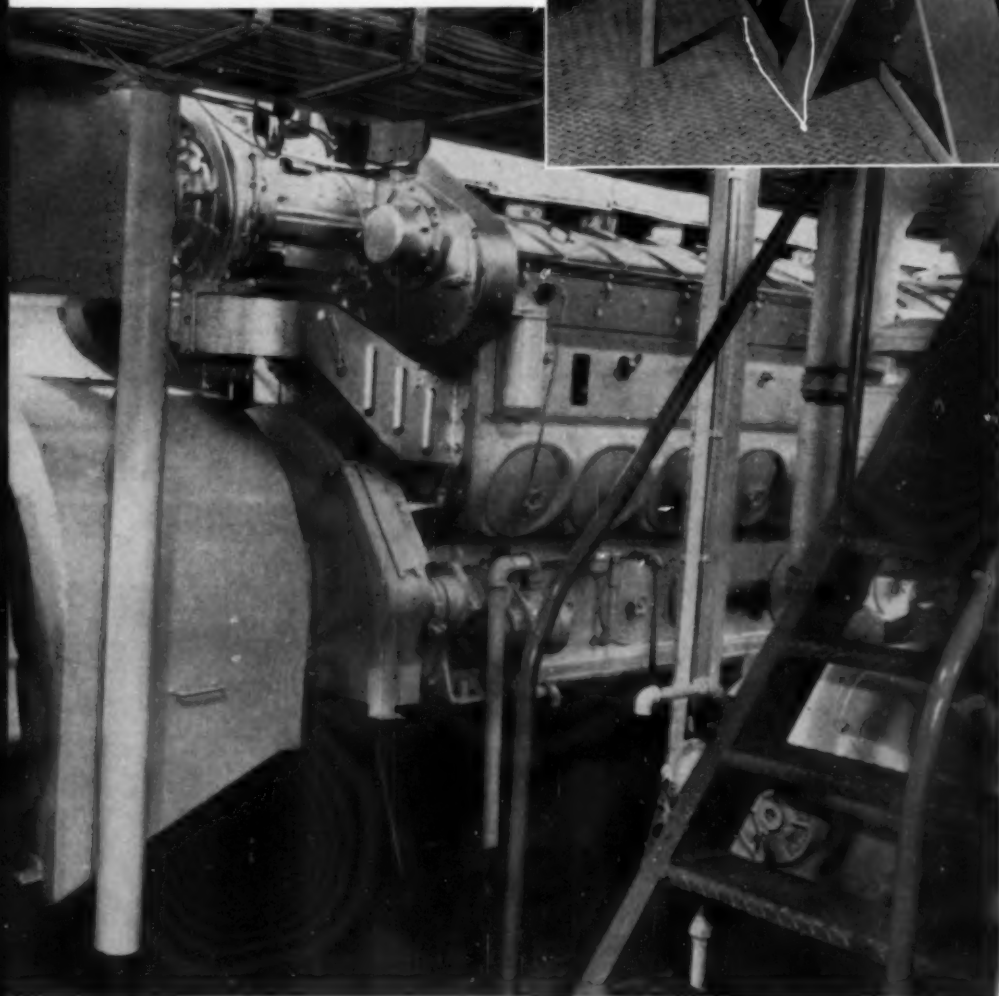
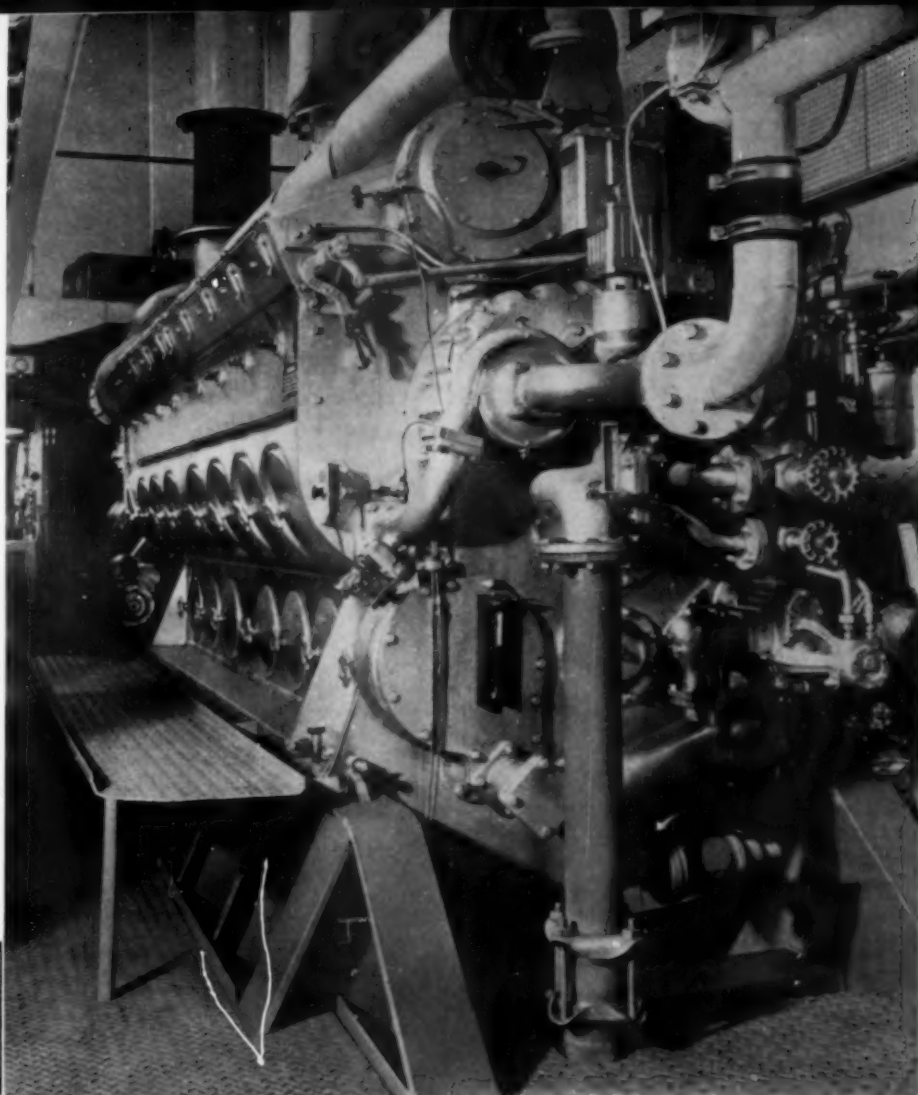


One of the main propulsion engines, a 1600 hp GM model 567C diesel engine, in the *M/V Ned Merrick*.

This engine has been designated the model 567D. Changes made in the "C" engine were: upper connecting rod bearings and piston carrier wrist pin bearings were changed to the silver type bearings; improved heavier main bearing caps were added; needle valve injectors were also added as they tend to help the overall fuel economy; new pistons were necessary in order to change the existing 16.1 compression ratio to 14.5:1 ratio to satisfy turbocharger requirements.

The mechanics of turbocharging the 567 engine began by removing the engine driven Roots type blowers and adding a single turbocharger. This turbocharger, designed by General Motors, is connected to the present rear end gear train by planetary gearing which insures positive drive at starting and during engine acceleration. An overrunning clutch is located between the ring gear of the planetary system connecting the turbocharger to the gear train.

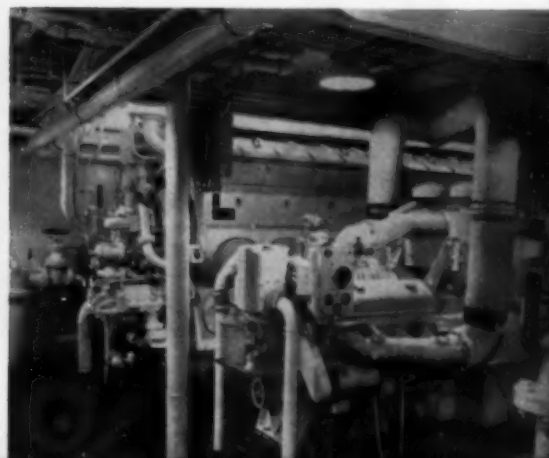
After sufficient energy is available in the engine exhaust to make the turbocharger self-sustaining, the overrunning clutch permits the turbocharger rotor to run faster than the engine-driven gears would drive it. The ring gear of the planetary set is normally stationary when the engine is operating at low power or undergoing acceleration from low speed. When the turbocharger rotor free wheels,



the ring gear is caused to rotate in a direction opposite to the direction of rotation of the turbocharger and at a relatively low speed. The turbocharger is, therefore, mechanically driven through the gear train to approximately 75% load at any given engine speed.

Auxiliary and ship's service power is provided by two GM Diesel 100 kw generator sets. Navigational equipment include a radar with a 7-ft. scanner on a retractable mast, aft of the pilot house; gyro-compass; radio-telephone; automatic pilot; 19-in. carbon arc searchlights; air-horn and running lights.

Lower engine room view of the *M/V Leonidas Polk*. 100 kw General Motors diesel-generator set is shown between the two main propulsion engines.



FIVE SMALL 15-39 HP DIESELS ADDED BY I-H

International Begins Importation of German Engines from Its Neuss Plant; Feature High Degree of Interchangeability and Wide Range of Industrial Applications

By DOUGLAS SHEARING

FIVE industrial diesels, new to the American market and ranging from 15.8 to 39.6 maximum horsepower, have just been added to International Harvester's engine line. The small diesels are being imported from the Company's subsidiary firm in Neuss/Rhine, Germany, which has been producing diesels since 1949 and the five new engines since 1956. The Neuss Works is one of International's earliest overseas factories, being established by the Chicago firm in 1908.

Built in two, three, and four cylinder sizes, the Neuss diesels are well suited for the oil fields, irrigation, railway and trailer refrigeration, marine, generating sets, and other industrial power applications. According to C. E. "Skip" Jones, International's Engine Sales Manager, "the addition of the five models effectively supplements the Company's line since they (the new engines) are all rated lower than the smallest diesel presently built in Melrose Park, Ill. We now range from 66 to 817 cu. in. piston displacement and this should substantially step up the Company's overall distributor sales and OEM marketing program."

Each of the five diesels is of the four-cycle naturally aspirated valve-in-head type with direct starting and utilizes the International swirl type pre-

combustion chamber with glow plug. Compression ratio on all engines is 19:1. Here are the principal specifications and ratings and note in particular that the model designations coincide with the respective piston displacements:

Model	No. of Cyls.	Bore and Stroke	Displacement
DU-66D	2	3 1/4 x 4	66.3
DU-74-D	2	3 7/8 x 4	74.3
DU-99-D	3	3 1/4 x 4	99.5
DU-111-D	3	3 7/8 x 4	111.3
DU-132-D	4	3 1/4 x 4	132.7

Model	Cont. HP		
	Max. HP @ 2000 RPM	Int. HP @ 2000 RPM	@ 2000 RPM
DU-66D	15.8	13.8	12.6
DU-74-D	17.4	15.7	14.0
DU-99-D	22.8	21.4	18.2
DU-111-D	24.6	22.2	19.8
DU-132-D	39.6 HP @ 2400 RPM	34.6 HP @ 2400 RPM	31.6 HP @ 2400 RPM

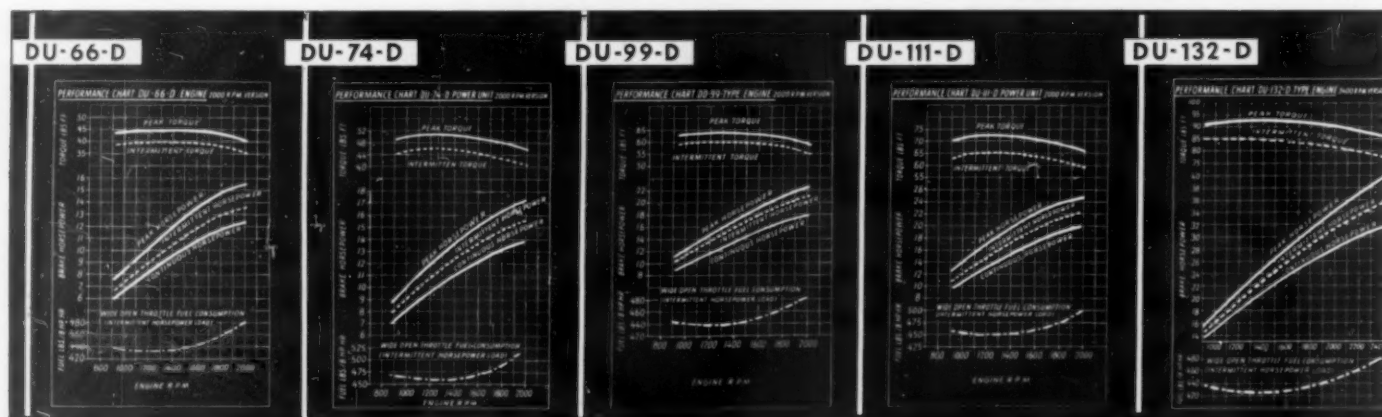
All ratings are for engine equipped with fan,



radiator, clutch, air cleaner, and generator. Performance curves for all five engines are illustrated.

The "DU" diesels can readily be classified as a family not only because of the standard 4 in. stroke and only two cylinder bore sizes as indicated above, but also because of the high degree of interchangeability of a number of major components. Namely, these are: connecting rods, main and connecting rod bearings, valves, valve springs, push rods, and rocker arm assembly parts. Crankcases for all five engines are machined from three basic blocks and piston and sleeves are of two sizes. Interchangeability of accessories is also quite extensive.

Power curves for the five new DU models. With exception of 2400 rpm rating for DU-132-D, balance of line is at 2000 rpm.





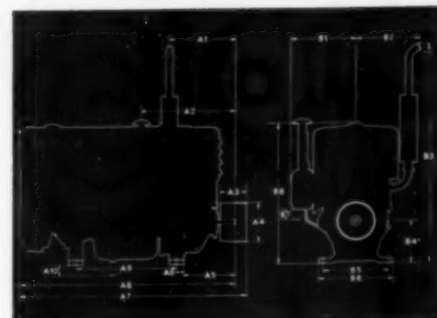
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4	B5	B6	B7	B8
DU-66-D	13.75	15.	6.38	9.50 DIA	12.59	1.50	45.47	43.12	16.03	4	12.56	15.19	51.56	10	16	17.50	2	34.50
DU-74-D	13.75	15.	6.38	9.50 DIA	12.59	1.50	45.47	43.12	16.03	4	12.56	15.19	51.56	10	16	17.50	2	34.50
DU-99-D	15.88	21.88	6.38	9.50 DIA	12.59	1.50	49.66	47.31	20.22	3	15.19	15.16	52.	10	16	17.50	2	34.50
DU-111-D	15.88	22.62	6.38	9.50 DIA	12.59	1.50	49.66	47.31	20.22	3	16.99	15.16	52.	10	16	17.50	2.19	34.50
DU-132-D	15.88	22.62	6.38	9.50 DIA	12.59	1.50	53.62	51.28	24.19	3	16.99	15.16	52.	10	16	17.50	2.19	34.50

Dimensional chart and diagram. All dimensions are in inches.

One of the first distributor test installations of the German-made I-H diesels. Here a DU-132-D power unit drives a pump lifting rice irrigation water from main to smaller channel in Vinton, La.

All models are available from stripped engine to complete power unit and on the latter the hood is hinged to permit easy access to the fuel tank, cooling system, oil pan, and battery. Operating levers and instruments are grouped for easy one-hand, one-glance control. Electrical equipment is 12 volt and both starter and generator are Robert Bosch. Dimensional drawings and chart are illustrated. Basic engine weight (with starter and generator; without clutch) is as follows: model DU66—408 lbs.; DU74—410 lbs.; DU99—520 lbs.; DU111—524 lbs.; and DU132—589 lbs.

Injection pumps and nozzles on all engines are



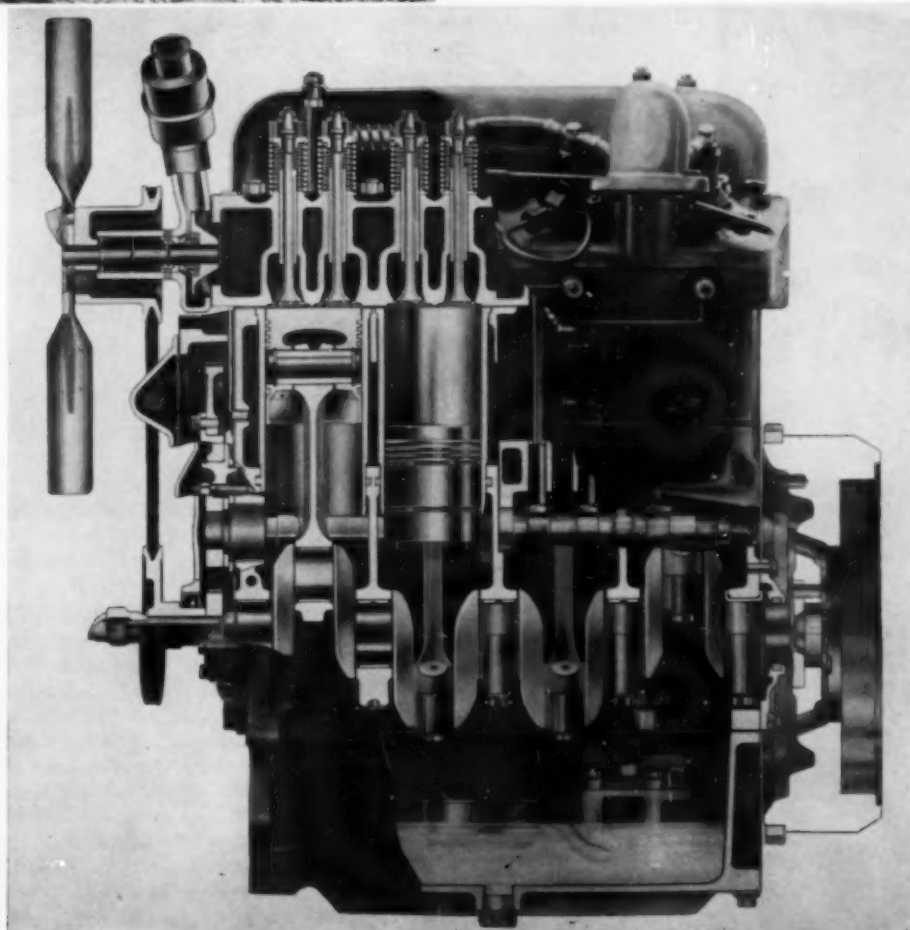
Robert Bosch and the pump incorporates either a mechanical or hydraulic built-in governor to meet application and load condition requirements. The cooling system pump is of the centrifugal engine driven type. A thermostat control and radiator curtain is provided to assure rapid warm-up and required operating temperature. Force feed, full pressure lubrication is supplied to all bearing surfaces with the lube pump in the sump and engine gear-driven. Main and connecting rod bearings are replaceable, with the former 2 1/4 in. dia. and the latter 1 3/4 in. dia.

One exhaust and one intake valve are used per cylinder with the injection nozzle and pre-combustion chamber set at an angle. The head of the aluminum piston forms a saucer-shaped combustion space. Pistons have three compression rings and two oil rings and ride in removeable wet cylinder sleeves installed with O ring seals.

In announcing the new engines, Jones stated that they will be competitively priced and have been well tested in numerous applications prior to their introduction. International in Melrose Park has actually been importing the diesels for approximately two years but all these units have been fitted for overseas equipment and re-exported. In reviewing their application, Jones pointed particularly to their adaptability to railway mechanical reefers, and railroad piggy-back trailers, and over-the-road refrigerated units. In addition, with their range to 39 horsepower, he feels they are suited to water pumps as illustrated, water well drill rigs, portable generator sets, conveyors, lift trucks, small compressors, compactors, cranes, etc.

A complete stock of parts will be maintained at centrally located depots in this country and by International's selling distributors.

Cutaway of the DU-132-D four cylinder naturally aspirated engine. This unit has a maximum hp rating of 39.6 at 2400 rpm.



OIL ANALYSIS KEYS FLEET PM PROGRAM

**Pacific Intermountain Express Trims Maintenance Costs
By \$75,000 a Year With Laboratory Checks of Engine
Oil; Program Helps Cut Road Failures 2½ Times,
Can Pinpoint Potential Engine Faults**

A MODERN maintenance "detective" behind the scenes at the Pacific Intermountain Express terminal in Emeryville, Calif., is quietly causing a radical revolution in the truck maintenance field. Geared to stop trouble before it starts, P-I-E's maintenance research laboratory there is relentlessly tracking down the hidden and elusive aches and pains which make an engine break down. Atoms and oil are providing the answers for this unique operation which is constantly thwarting road failures and expensive repairs. Currently trimming the company's maintenance costs by more than \$75,000 a year, the lab now helps dictate all line-haul engine maintenance for P-I-E's entire over-the-road fleet.

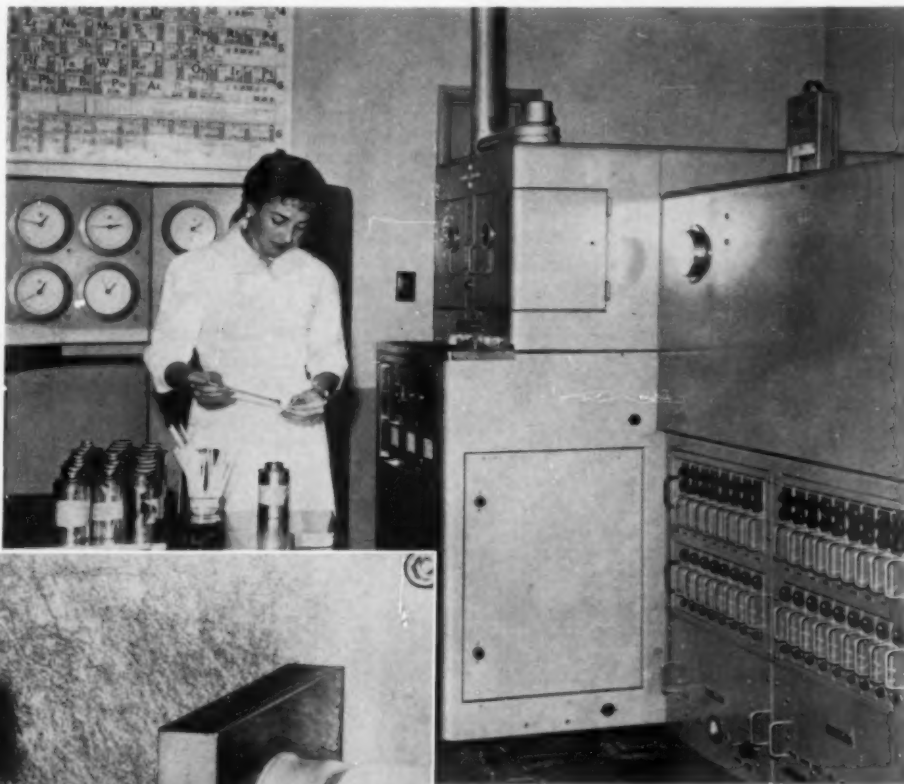
With little more than a thimbleful of oil, the lab can accurately diagnose the state of an engine, determine what parts are wearing and how fast. Able to detect engine ills otherwise invisible to the human eye, the lab is a valuable remedy for two problems that plague even the best planned preventive maintenance controls. One is over-maintenance with its wasted materials and labor cost due to unnecessary repairs. The other is

under-maintenance felt in frequent road failures and costly delays in customer service.

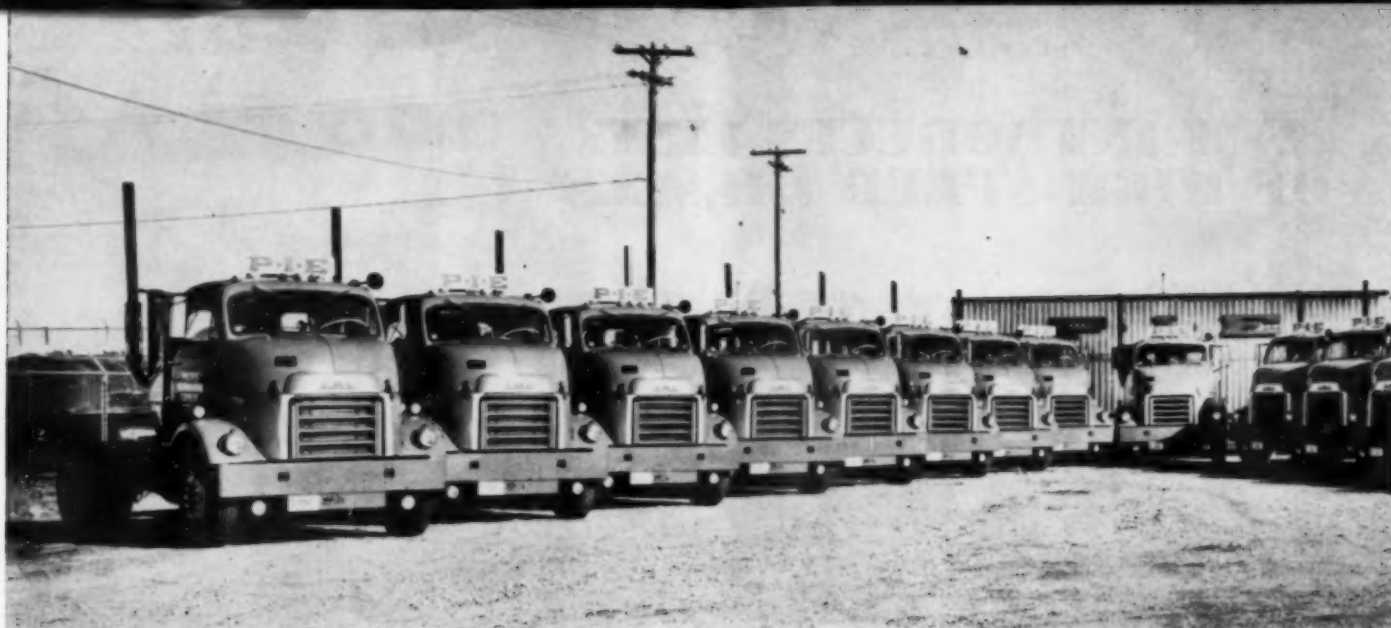
Installed in 1957 at a cost of around \$60,000 (plus personnel training), the lab has long since justified the initial investment. When lab work began, road failures averaged one every 40,000 mi. Today these average one every approximate 100,000 miles.

Lab technician places oil sample from P-I-E truck into the porcelain container. Samples will be placed in Spectrometer, to right, where it will be tested. Behind the technician is part of battery of 16 dials which indicate oil contaminant composition in parts per million.

Closeup of oil sample in Spectrometer cabinet. Sample is in white "boat" at center. Circular carbon electrode is rotated in sample, then it is subjected to 22,000 volts fed through carbon pin above circular electrode.



Basically the lab tests everything and anything that goes into or hangs on an engine—oil, diesel fuel, additives, oil filters. It is also in the very early stages of attempting to run controls on differentials and transmissions, based on gear oil samples, as well as the diesel engines on refrigerated trailers. Major share of the work, however, revolves around the oil samples removed every 7500 mi. from the crankcase of an engine. The lab receives approximately 1500 samples a month. Only a pint of oil is required for a complete series of tests. Accompanying each sample is certain information from the shop, including such



items as the number of miles the oil has been used and the mileage on the engine since its last complete overhaul.

All the tests are performed by the lab's Spectrometer. Occupying one entire room in the lab, it measures and pinpoints the type of metallic content of the oil. This is a good indication of engine wear. Since various parts of an engine contain different metals or alloys, such as aluminum (in pistons) and iron (cylinder walls), abnormal amounts of a specific one in the oil warn that trouble is brewing.

The Baird Atomic Dow Direct Reading Spectrometer is an optical-electronic instrument used to determine and measure in parts per million sixteen elements simultaneously in one substance. The entire analysis is accomplished within one and half minutes. The preparation of the sample is merely placing two milliliters of used lubricating oil, drawn directly from an engine oil pan into a small porcelain boat. A carbon electrode disc is submerged into the sample and rotated. This action picks up the oil and places it into position for the burn. Twenty-two thousand volts of power sparks across a carbon pin and the disc. The light which is illuminated by the burning of the oil is transmitted through the optical portion of the instrument. A process of fractionation is applied with a grating (prism), which sends the light waves of the various elements on their characteristic paths. The light waves are then picked up by the highly sensitive photo-electric tubes (one for each element). The changing of light into energy is what triggers the operation of the electronic portion of the instrument. This energy is then stored in capacitors where it is released at the end of the exposure cycle. This in turn starts a bank of sixteen clocks, one for each element, that have been calibrated to be read in parts per million.

The Spectrometer can come up with some downright amazing answers. Often it has reported excessive amounts of iron, copper and lead. The shop is advised that the copper-lead bearings on the iron crankshaft may be wearing. Sure enough, when the engine has been torn down, the damage has been confirmed and the crankshaft salvaged.

➤ This battery of GMC tractors is but a small part of the vast PIE fleet, maintenance of which is controlled by the 1500 monthly oil sample tests carried out by firm's research laboratory.

Lab worker explains operation of Baird Atomic Dow Direct Reading Spectrometer to visitor as she positions porcelain boat containing oil sample in machine. ➤

Frequently silicone has been discovered in the oil, indicating that dirt was getting into the engine. Shop inspection detected a faulty air intake system. Other danger signals on the Spectrometer dials: excessive amount of iron may show wear on the cylinder walls; chromium may point to piston-ring wear; aluminum may mean that the pistons themselves need attention.

Physical characteristics of the oil are examined carefully. This is to assure that the oil is performing the proper lubrication job and guards against any contamination by fuel soot, sludge or water. Engine operating temperature is watched closely. An excess amount of sludge, soot and carbon indicates a cold operating engine. Fuel system is checked also. One of the worst enemies of an engine lubricating system is water in the oil. The old method for checking for water in the oil was to drop some on a hot manifold. If it sputtered, it had water in it. The lab goes much further and is much more accurate.

Should the lab find a problem it advises the shop either by teletype or long-line telephone circuits. When the engine is torn down, the shop in turn notifies the lab of the work performed. Thus, the next time oil is tested from that engine, the lab will know if it is testing an overhauled engine.

The lab at first posed some tough problems for P-I-E's maintenance staff. With no one else doing exactly the same type of analysis and no previous experience records to rely on, quite a bit of experimenting was necessary to determine the correct formulas. In establishment of standards, 46 engines were analyzed in complete detail at frequent intervals through to the end of their service life. One thing is certain, there is no



second guessing. Neither is there any dependency on the judgment of any one individual. A driver may think an engine is fine, may even argue about it when the lab says there is something wrong with a given engine. However, when the mechanic pulls the part out, the Spectrometer is invariably correct. The lab, as a result, doesn't get many arguments any more, at least not from the old timers with experience.

There was a day though when it appeared that the Spectrometer had gone completely haywire. To the lab's consternation, a routine check of an oil sample came up with the unbelievable results that everything in the engine was bad—in fact, the unit couldn't possibly be running! Naturally, the lab hit the panic button and didn't really calm down until some time after it learned the truth. Some prankster had submitted the sample, claiming it was from one of the company's trucks. What the lab didn't discover until afterwards was that sample came from a parts cleaning machine instead.

F-M INTRODUCES LINE OF HIGH SPEED DIESELS

First Models Include Five Engines Ranging From 110 to 306 HP; Four Cycle Engine Series Has Only Two Basic Cylinder Sizes For Units Rated From 37 to 609 HP

FAIRBANKS, Morse, & Co., well known in the diesel field as a major producer of large, high horsepower, slow and medium speed engines, has announced a new series of heavy duty, high speed diesels. Designated the 50A series, these engines are four cycle units. Initial plans call for distribution and service to be handled through Fairbanks, Morse sales and service offices throughout the country.

Five versions of the 50A engines were included in the F-M announcement of the series. Larger and smaller sizes will be added in the near future. First 50A5 models, with bore and stroke as shown are:

110 hp, with 4 cylinders, turbocharged, 4.92 x 5.12 in.

140 hp, with six cylinders, 5.00 x 5.875 in.

200 hp with six cylinders, turbocharged, 5.00 x 5.875 in.

Initial 50A6 models, with 6.25 in. bore and 6.50 in. stroke, are:

240 hp with six cylinders.

306 hp with six cylinders, turbocharged.

All the above ratings are at 1800 rpm. The complete 50A5 series will consist of, in addition to the engines noted above, naturally aspirated models, with 2, 3, 4, 5, 6, and 8 cylinders, all with 4.92 x 5.12 in. bore and stroke.

The 50A6 series, in addition to the six cylinder units, will include an 8 cylinder Vee model with turbocharging and a 12 cylinder Vee unit in naturally aspirated and turbocharged versions. All 50A6 engines have a 6¼ in. bore and 6½ in. stroke. Compression ratios of the 50A5 models are 15.8:1 in the naturally aspirated units with 4.92 x 5.12 bore and stroke, 16:1 in the 6 cylinder units with 5.00 x 5.875 bore and stroke, and 14.5:1 in turbocharged versions.

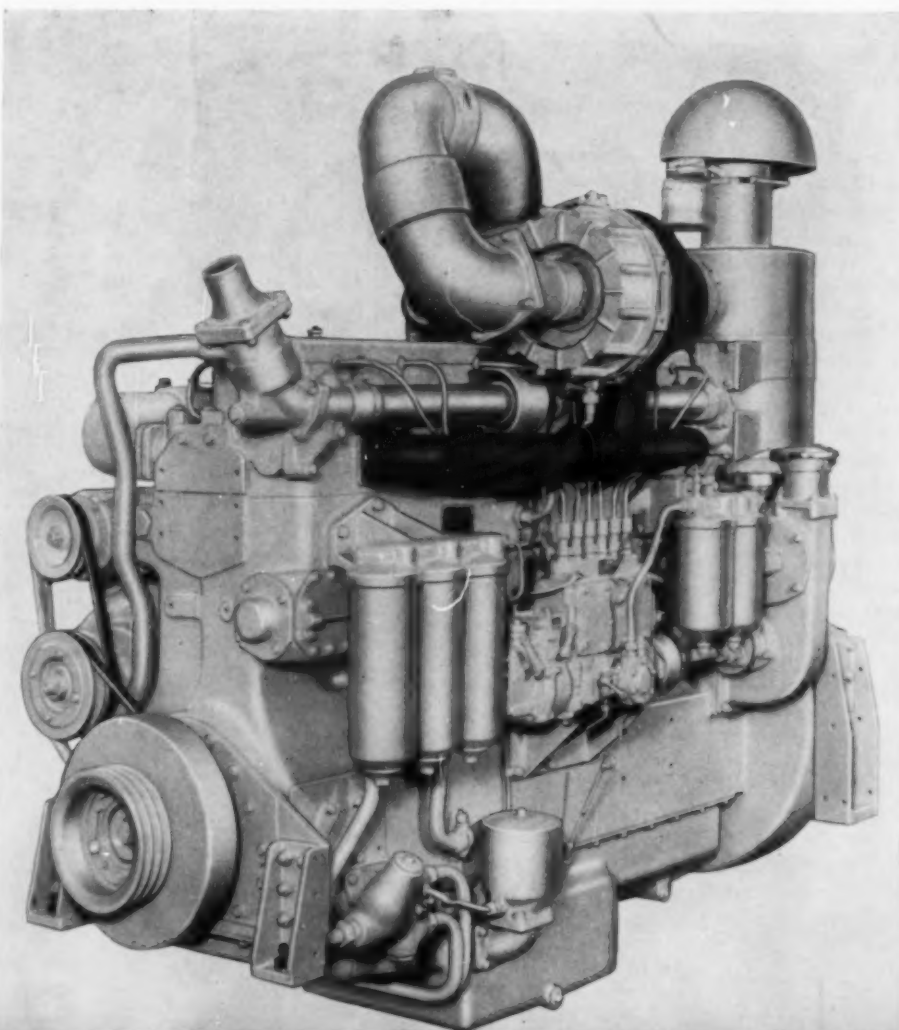
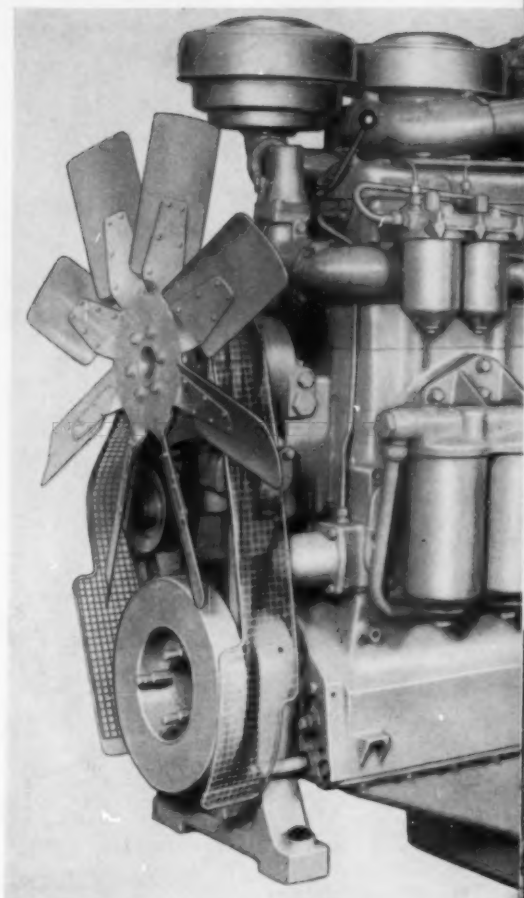
Fuel consumption for continuous ratings at 1800 rpm will not exceed .41 lbs./hp/hr. for naturally aspirated engines and .40 lbs./hp/hr. for turbocharged engines, according to F-M engineers.

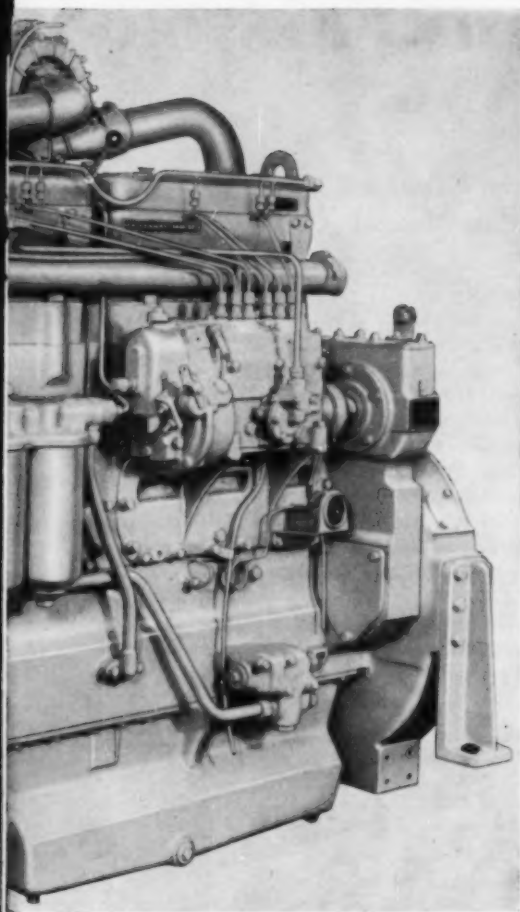
Ratings of these engines range from 37 hp for the 2 cylinder 50A5 to 690 hp for the 12 cylinder, turbocharged 50A6. Units up to 100 hp are available also in speeds to 2200 rpm.

"The 50A is a multi-purpose diesel that will handle many lighter duty jobs below the range

of our heavier engines," said Sheldon K. Howard, F-M's director of marketing. "It is particularly well adapted for electric power generation and for installations such as marine propulsion and stationary power units, where long periods of uninterrupted running are required." Industrial plants, commercial businesses and hospitals are among potential users of these F-M engines when they are incorporated in generating sets to provide primary and standby power. "In the marine field, model 50A units will be useful in propulsion for

Right, six-cylinder, 6¼ x 6½ in. bore and stroke model 50A6 diesel is rated 306 hp at 1800 rpm. Six cylinder 50A5, 5.00 x 5.875 unit below produces 200 hp at 1800 rpm. Both engines are available as naturally aspirated models. Fairbanks, Morse is currently producing five models in the 50A series.



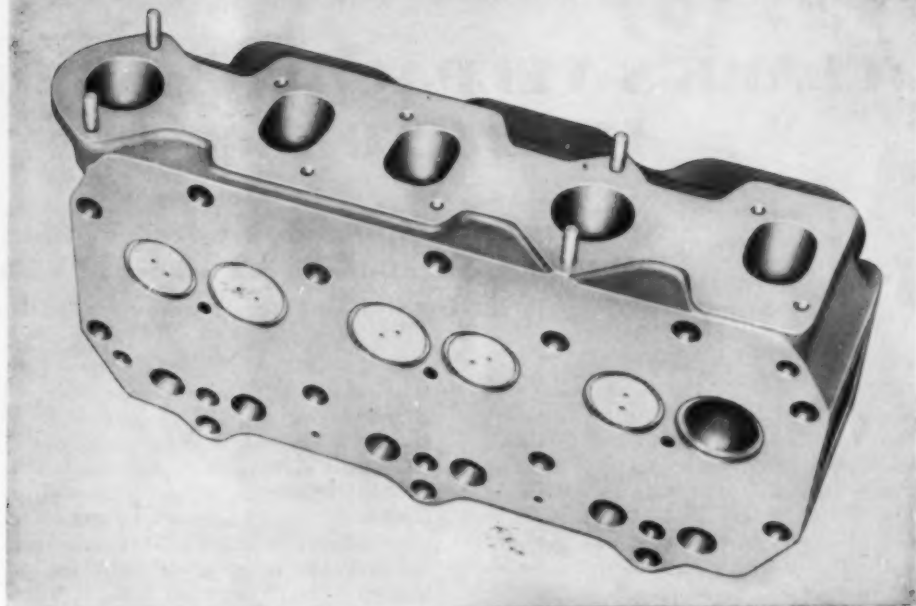


both work boats and pleasure craft," Howard continued. "Smooth operation at variable speeds, including low idle, and construction in compliance with American Bureau of Shipping and Coast Guard requirements make it particularly suitable for fishing boat use."

The engine line is conservatively rated to provide maximum dependability for continuous type operations in both the naturally aspirated and turbocharged versions. Brake mean effective pressure when turbocharged is under 125 psi; naturally aspirated, the rating is under 100 psi. Design is such that there is an ample margin for rating increases as field experience justifies.

Design features include hardened steel crankshafts, low bearing loads on both main and connecting rod bearings, chrome hardened cylinder bore in wet liners and alloy steel connecting rods with 35° angle at the split end to allow removal of rod and piston assembly through the bore.

Combustion is by direct injection of fuel into an open type combustion chamber which has a toroidal cavity in the piston crown to promote good combustion at all speeds and loads and to achieve fast response to load changes as well as providing quick and easy starting. Model 50A5 engines are fitted with C.A.V. base mounted fuel injection pumps and detachable C.A.V. nozzle holders and multihole nozzles. A diaphragm transfer pump suitable for 6 ft. lift is standard equipment on both series. Model 50A6 engines have Simms injection pumps and nozzle holders with pre-calibrated nozzles.



➤ Cylinder head is of cast iron; has integral rocker brackets, high wall valve chamber. Combination heads cover two or three cylinders per group, as required.

Cross sectional drawing, model 50A engine. ➤

Cylinder heads are of high grade cast iron with integral rocker brackets. A high wall valve chamber houses the overhead valves, rockers and injectors. Removeable valve guides and seat inserts are included. Individual cylinder heads are utilized on the Vee engines while the inline units use heads which cover two or three cylinders per group, as required.

The crankcase block is of cast iron and extends below the crankshaft center line for added strength. Weep holes in the side of the block of inline units make identification of water or oil gasket leakage simple.

The chrome plated cylinder liners are of centrifugally cast grey iron. The "pimped" chrome plating is honed to provide minute oil pockets for good lubrication and minimum wear. Removeable wet type liners are positioned by top flange mounting. Pistons of low expansion aluminum alloy are fitted with three compression rings and two oil scraper rings, one of which is mounted below the piston pin. The piston pin is full floating and is of case hardened alloy steel.

The forged crankshaft, of alloy steel with induction hardened pins and journals, is counterbalanced and dynamically balanced. Copper-lead precision bearings are used for main and connecting rods. Main bearing diameters for the 50A5 series are 3.75 in. On the 50A6 inline units, bearing diameters are 4.75 in. Six cylinder inline engines have seven main bearings. A torsional vibration damper is standard on all units with more than four cylinders.

The camshaft is located high in the block, which provides a short valve push rod assembly. There is one intake and one exhaust valve per cylinder.



Inlet valves are masked to promote swirl in the combustion chamber and valve seat inserts are used on both intake and exhaust valves.

Turbochargers used on the F-M engines are by either Schwitter or C.A.V., depending on the engine model. Engine lubrication is of the pressure type via a gear driven pump which draws lube oil through a detachable oil strainer mounted in the oil sump. Oil is piped through an externally mounted pressure relief valve to a full flow lube oil filter with excess spilling back to the sump.

The bare engines are presently being built in England. Because only two basic cylinder sizes are used over the major portion of the line, the series offer good parts interchangeability. With key sizes also offered in turbocharged models, the 50A units obtain a smooth progression of rating over the entire range covered by the various engine models.

CLARK'S VEEPAC PACKAGED COMPRESSOR IN 825 TO 1000 BHP RANGE

**New Sets Built in 10 and 12 Cylinder Models Are Expected
To Find Applications in a Number of Fields; Can Mount
Up to Six Compressor Cylinders**

THE first installation of a new model packaged field compressor manufactured by the Clark Bros. Co. will be in a station of the Coastal States Producing Co. in Texas. The new units, introduced recently by Clark Bros., provide up to 1000 bhp mounted on a single skid only 35 ft. long, complete with radiator, scrubber, and accessories. The package can also be supplied on a duplex skid or as a stationary unit.

Designated the VeePac series, the packaged compressor sets are produced in two models: the TVM-10 rated 825 bhp and the TVM-12 rated 1000 bhp at 600 rpm. These are two cycle, turbocharged integral gas engine-driven compressors with V-type engines and horizontally opposed compressor cylinders, designed for dependability and long life in continuous field service. They are expected to find applications in field gas gathering, off-shore mounting, gas lift, repressuring, recycling, plant feeders, refining, secondary recovery, gas transmission on small pipelines, natural gas-line plants, and multiple service applications.

These units are of V-design for maximum hp/sq. ft. of skid or floor space. Wide spacing between compressor cylinders (42 in.) makes them readily accessible and permits use of very large compressor cylinders when necessary. On the model TVM-

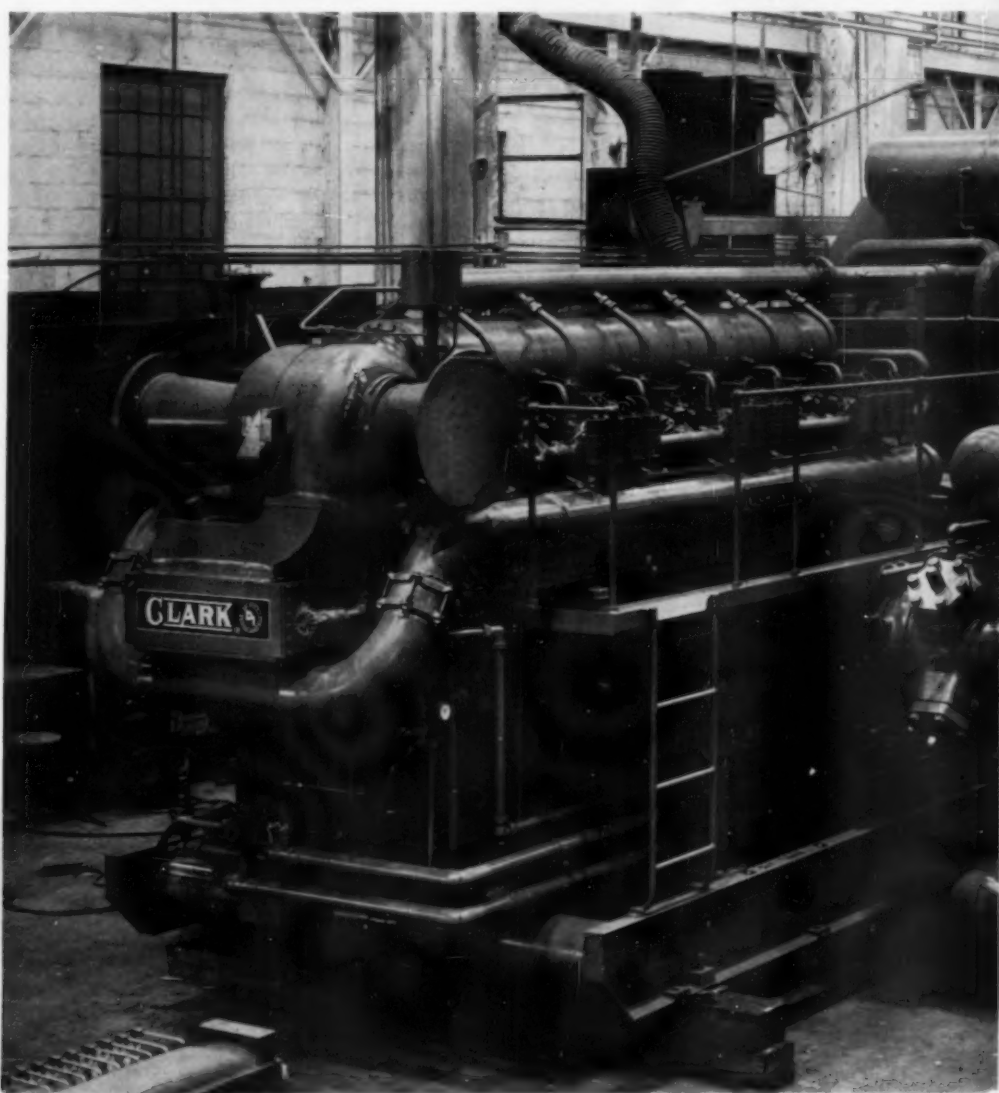
12, as many as six horizontally opposed compressor cylinders up to 26 in. in diameter can be mounted on either or both sides (up to three on each side) of the crankcase for maximum flexibility. Model TVM-10 can be fitted with up to five cylinders per unit. The model TVM-12 has 12 power cylinders, the model TVM-10 has 10. Both have bore of 8 $\frac{3}{4}$ in. and stroke of 9 in., and both have a conservative 104 bmep rating. A Bendix low tension, modified dual ignition system is used on these gas engines. The upper crankcase is a heavy-duty semi-steel casting which is keyed into the lower case. One-piece power cylinders with integrally cast water passages are inserted into the

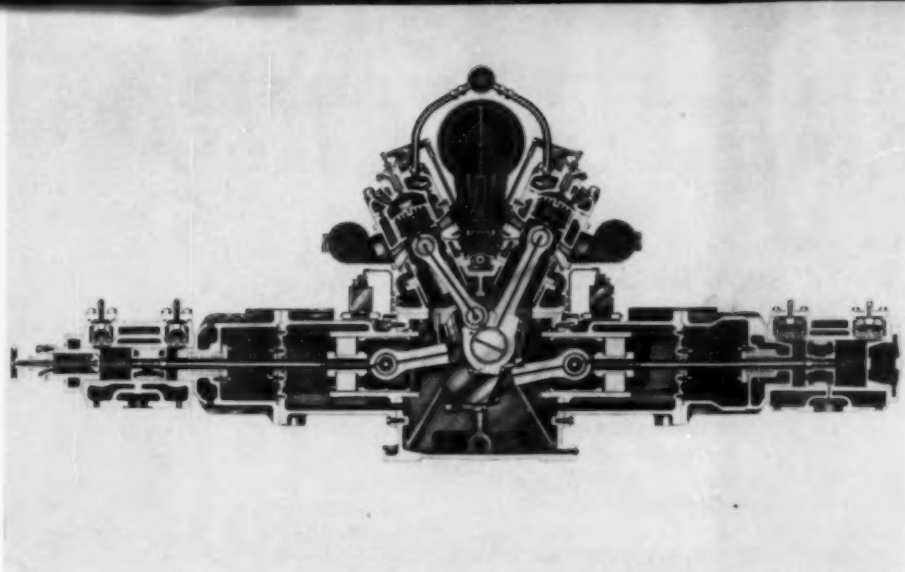
block. Power piston heads are oil cooled. The lower crankcase section is cast of fine-grain semi-steel and through-bolted for greater rigidity. Main bearing supports are bored for precision liners and supported by heavily ribbed cross members. The large, 8 in. diameter, crankshaft is a one-piece steel forging. Connecting rods are of die-forged steel rifle bored for full force feed lubrication. Main and connecting rod bearings are of aluminum and of the split shell type for durability.

The jet air-started turbocharger and Young inter-cooler are neatly installed. It is completely automatic and provides optimum air supply to the

Shop view of model TVM-12 four-stage packaged compressor station during assembly. This natural gas fuel, 12 cylinder model is rated 1000 hp at 600 rpm, can drive up to six compressor cylinders up to 26 in. in diameter. Complete set can be packaged on skid or supplied for foundation mounting. Note Young inter-cooler.

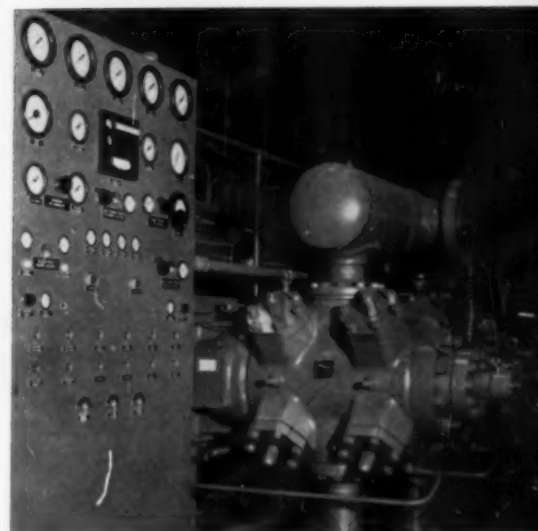
Closeup of lower crankcase showing thru-bolts which tie together upper edges of crankcase and prevent cylinder movement and distortion.





◆ Cross section of Clark Bros. model TVM packaged compressor.

View of control panel mounted on compressor skid. Panel is equipped with Alnor pyrometer, Bristol suction and pressure unloading controllers, Amot pressure and temperature controls and indicators.



engine through its entire operating range. The scavenging air intercooler eliminates danger of detonation at high ambient temperatures, and reduces thermal loading and cooling duty per bhp. An automatic ignition timing control combines

with the turbocharger to provide good response, speed control, and low fuel consumption over a wide range. Turbocharger and intercooler are mounted at the front of the engine.

The Clark-designed radiator handles cooling of jacket water, lube oil, and gas streams compressed by the compressor. The five cooling streams are arranged side by side in vertical plane on opposite sides of the radiator. Induced draft cooling draws air horizontally over the cooling surfaces and discharges it vertically from the top. This design and low suction velocity eliminates possibility of overheating through recirculation. The radiator fan is driven by a Berry low pressure hydraulic motor driven by a pump directly from the engine crankshaft. The oil pump is gear driven off the engine.

No external controls are mounted on the engine or compressor units. All are contained in a control panel. The controls are all pneumatic. The panel monitors fully automatic shutdown devices including fuel shutoff, opening of compressor bypass valve when compressor is down, low oil pressure, low water pressure, high water temperature, engine vibration, turbocharger overspeed. All shutdown devices have pneumatic indicators.

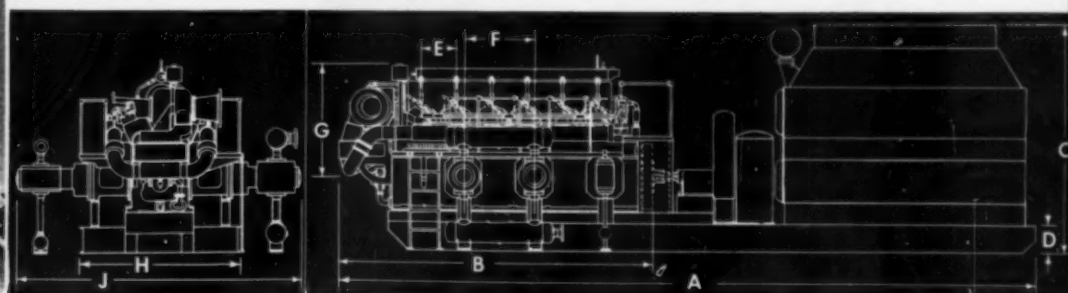
All TVM series VeePac compressor sets are pre-engineered for easy transportation and installation. The gas engine driven compressor including radiator and all accessories can be mounted on a single skid, or on two skids, or the compressor can

be installed as a stationary unit with minimum costs for foundation, piping, and installation.

Because the VeePac can be fitted with as many as six compressor cylinders, it has exceptional loading flexibility when several services are handled at the same time or when gas is being compressed in a number of stages. Construction of both the engine and compressor cylinders makes it possible to handle one or several gas streams at high differential pressures across the machine.

Compressor piston speeds are held at conservative rates to assure long life. Cylinder bodies are of cast semi-steel nodular iron or forged steel to meet pressure requirements to 6000 psi and higher. Valves are of the heavy duty, multiple ring type with precision cast bodies and induction hardened seats. Piston rods are induction hardened for maximum strength and wear resistance.

Dimensional drawing for skid-mounted TVM packaged compressor sets. "A" dimension for TVM-10 is 33 ft.; for TVM-12 it is 35 ft. Height (C) is 11 ft. 6 in. for both models.



TURBOCHARGED 2-CYCLE DIESEL DELIVERS PARTIAL-LOAD ECONOMY

**New Six-Cylinder Nordberg at Hudson, Mass., Municipal
Power Plant Rated 4,250 HP at 240 RPM; Produced
13.8 KWH Per Gallon of Fuel at Average 63.7 Per Cent
Load in First 12 Months of Operation**

WHILE a bigger brother handles base load, a new 4250 horsepower turbocharged two-cycle Nordberg diesel is taking the peaks at the Hudson, Mass., municipal power plant, showing excellent economy at light loads. For its first 12 months of service, with loads ranging from 46 to 71 per cent and averaging 63.7 per cent, the oil-burning engine has delivered an average of 13.8 kilowatt-hours per gallon of fuel.

This New England plant has lots of history dating back to 1897 when the city bought the 10-year-old 150 hp steam plant from a "little outfit" that grew up to be General Electric. Then diesels came in 1928, including a 450 kw unit that still defies retirement, running for 52 hrs. in 1960. But the modern history of the Hudson generating station is pretty much the story of the three Nordberg engines. The first, designated No. 7 in

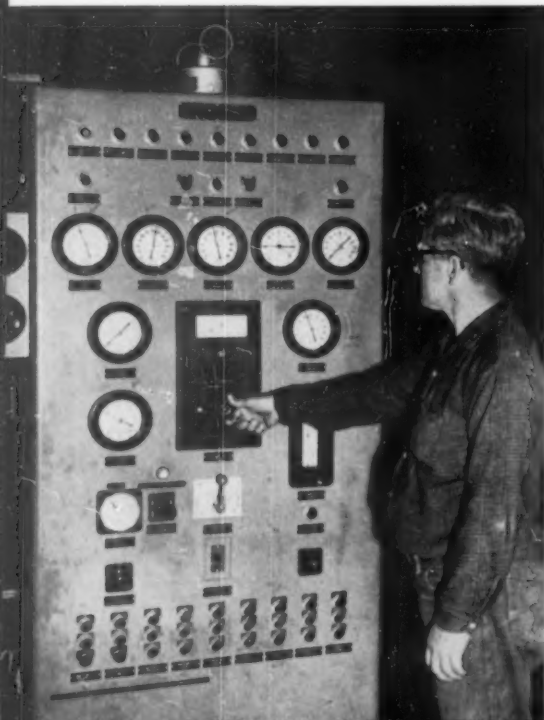
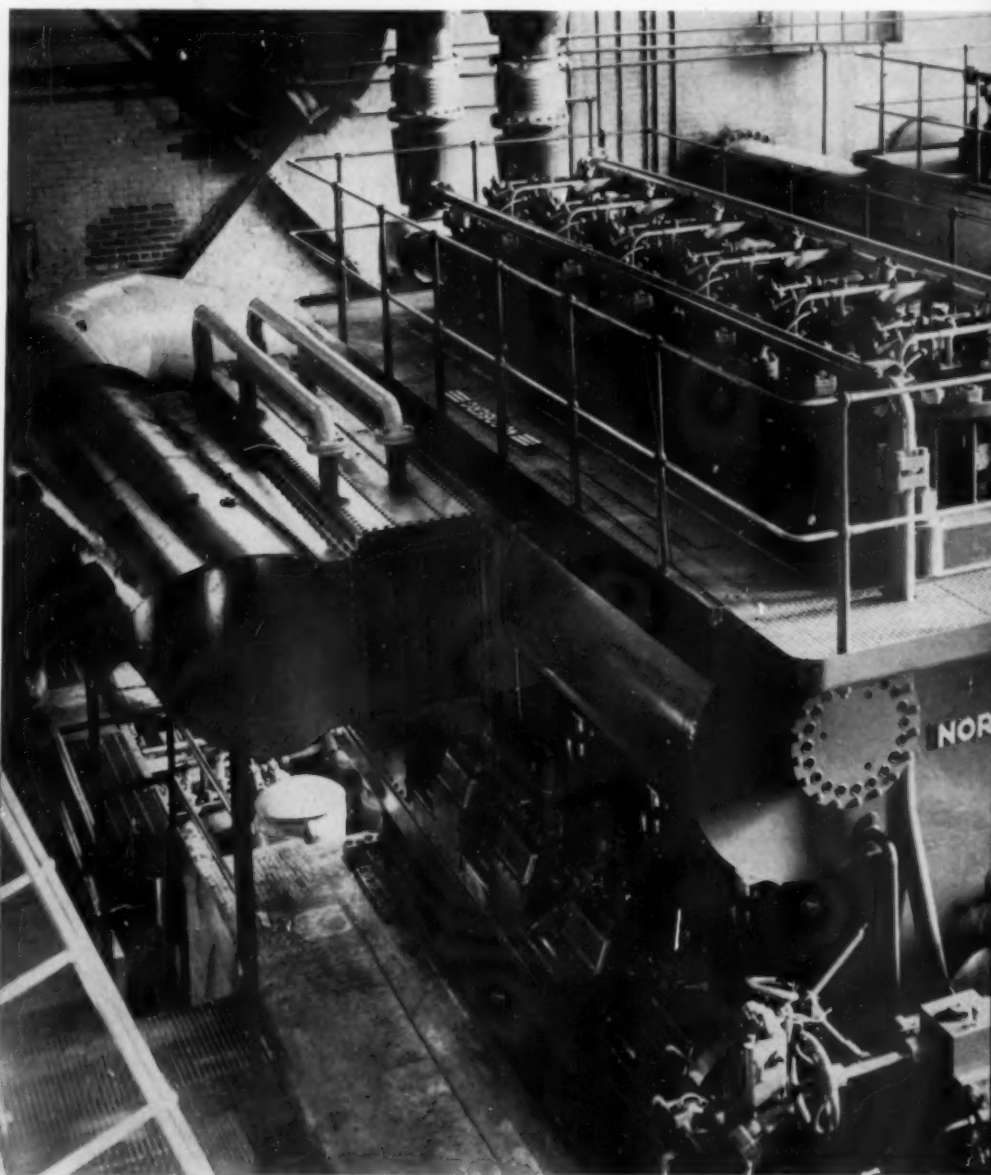
the plant, is a type TS-2110 two-cycle, crosshead-type, Nordberg diesel rated at 4250 hp at 225 rpm. This unit was installed in 1950 and by the end of 1960 had run 55,334 hours and produced 108,477,427 kw hrs. The second Nordberg is the plant's biggest engine, a type TSGL-2110 two-cycle crosshead unit rated 5100 hp at 240 rpm for dual-fuel operation. The big Dualfuel engine was installed in 1955 and promptly took over as

the base load generator. By the end of 1960, in less than six years, this engine ran 38,394 hrs. and produced 94,592,680 kw hrs.

The plant's newest diesel is not as big as No. 8 but has its own distinction. This engine is a Nordberg type TSGL-216-SC, two-cycle, trunk-type-piston, turbocharged Dualfuel diesel. With six cylinders, 21½-in. bore and 31-in. stroke, it

Three Nordberg diesels carry virtually the entire load in the Hudson plant. In the foreground is the plant's newest engine, a 4250 hp two-cycle turbocharged diesel. A 4250 hp unit which has run more than 55,000 hrs. and generated more than 100 million kw hrs. since installation in 1950 is at right rear. A 5100 hp Dualfuel engine is the largest in the plant and base load producer.

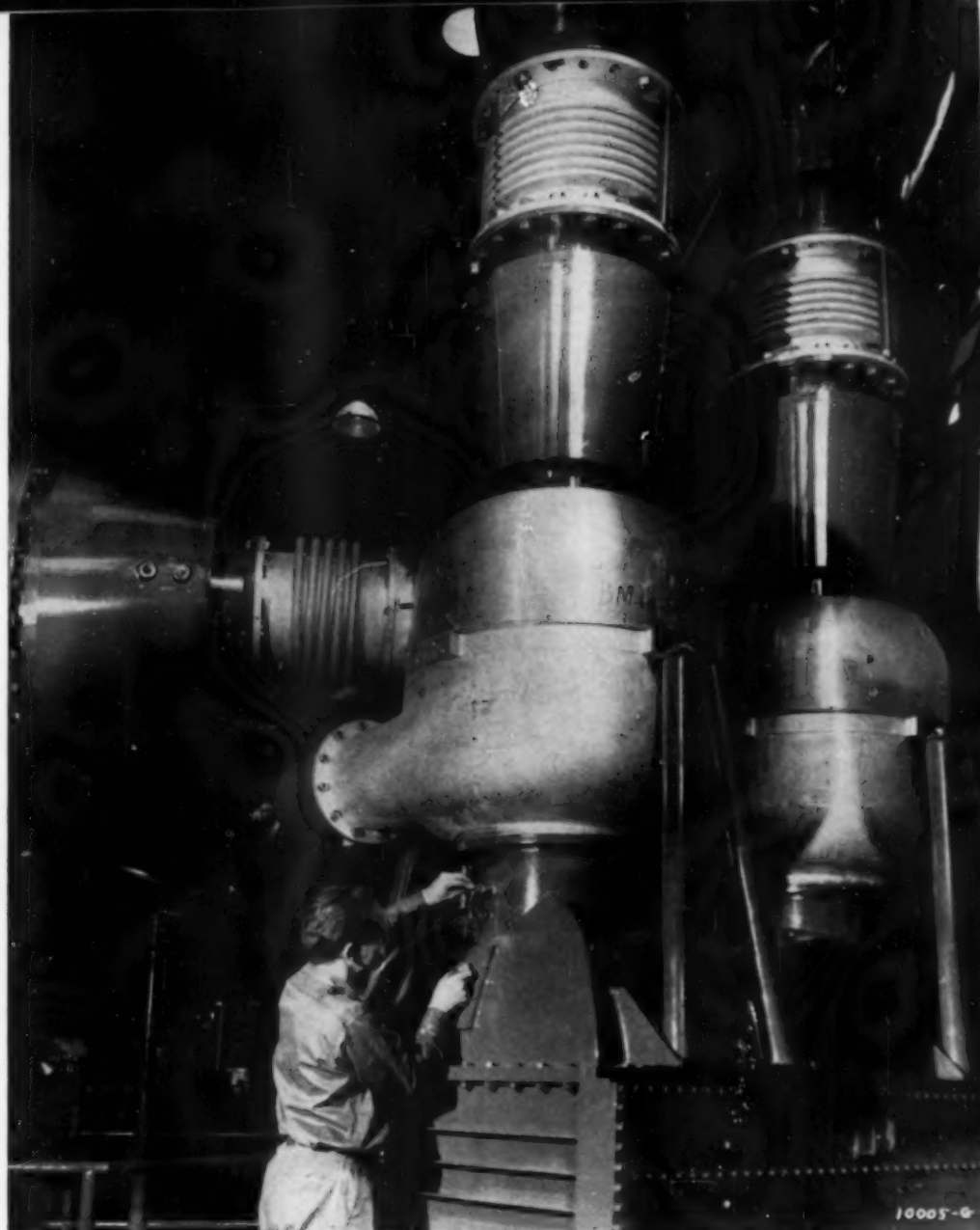
The supercharged Nordberg is served by a Nordberg engine panel which holds an Alnor exhaust pyrometer, Ashcroft gauges, a complete alarm system, and controls for motor-driven auxiliary equipment.



has a rating of 4250 hp at 240 rpm. Thus the six-cylinder turbocharged No. 9 delivers as much power as the 10-cylinder No. 7. The new engine fits neatly into the space previously occupied by a 2760 hp diesel.

Operating economy at partial loads is another feature of the new engine, and an important one in the Hudson plant. No. 8, as the biggest unit, retains the base load assignment. The new engine, like No. 7, takes a variable load which often dips below 50 per cent of capacity. The turbocharged unit was put into regular service in April, 1960, and by the end of March, 1961, had run 3,470 hrs. and generated 6,633,100 kw hrs. With a load that averaged 1911 kw, the engine consumed a total of 480,716 gal. of fuel, an average of 13.80 kw hrs. per gal. Table I gives the month-by-month figures on hours operated, power generation, and fuel consumption for the 12-month period.

The Nordberg engines have shown very low cylinder wear. A first inspection of the new engine after 2200 hrs. of service showed that the face of the rings hadn't worn in yet and there was no



Scavenging air for the supercharged Nordberg engine comes from the American air filter to the motor-driven American blower, then through a Young intercooler to a pair of DeLaval monorotor turbochargers, then through another Young intercooler to the engine intake header. Exhaust gases drive the turbochargers.

measurable wear on crank, main, or wrist pin bearings. The big No. 8 engine got its annual

Cylinder Wear, Nordberg 5100 Hp Engine
Cyl. No. 3 Inspected April 18, 1961
(Total Hours Operated 40,446)
Total Cylinder Wear To Date

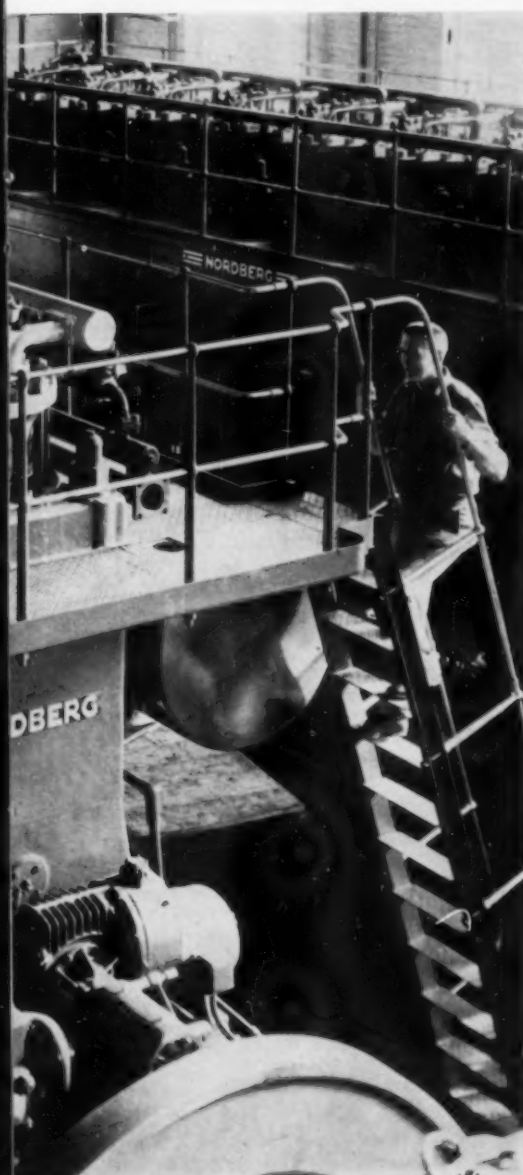
	Present Average	Previous Average	Total Wear To Date	Wear Per 1000 Hrs.
A 2 in. below top position	.00075	.001	.008	.0002
B 4 in. below top position	.0005	.0023	.0085	.00021
C 8 in. below top position	.00025	.0013	.005	.00012
D 3 in. above port	.00075	.0015	.0035	.00009
E 3 in. below port	.00025	.0018	.003	.00008

Cylinder Wear Since Last Inspection—6,902 Hours

	Par.	90°	Average	Wear Per 1000 Hrs.
A 2 in. below top position	.0005	.001	.00075	.00011
B 4 in. below top position	.000	.001	.0005	.00007
C 8 in. below top position	.000	.0005	.00025	.00004
D 3 in. above port	.000	.0015	.00075	.00007
E 3 in. below port	.000	.0005	.00025	.00004

preventive maintenance inspection in April of 1961 and the figures given in Table II on liner wear of No. 3 cylinder are typical. After a total of 40,446 hrs. of operation, maximum total wear (at 4 in. below top position) was just .0085 in., or .0002 in. per 1000 hours. For the 6,902 hours since the last inspection in May 1960, the same position showed wear of .0005 in. or a scant .00007 in. per 1000 hours.

A fact about operations at the Hudson plant is the use of automotive crankcase drainings for fuel. This economy fuel is used by all three of the plant's Nordbergs with unqualified success. Crankcase drainings are stored in a 420,000 gal. tank which is warmed by jacket water from all three engines. The oil then goes to a preheater where it is heated to 210 degrees F. by water passed through coils in the Nordbergs' exhaust silencers. The hot oil goes to a centrifuge and



then to a 1500-gal. supply tank. No. 2 fuel oil is stored in a group of tanks with aggregate capacity of 60,000 gal. and is transferred to another 500-gal. supply tank.

We have noted the use of exhaust heat and jacket water heat in the fuel system. Jacket water also is used for space heating—the garage, line crew office, and ready room. Cooling systems of all three Nordbergs are linked so that the idle engines can be kept warm. An ample supply of cold raw water is pumped up from the nearby Asabet River and circulated through the heat exchangers, intercoolers, and lube oil coolers. Both the main and auxiliary lube pumps for the No. 9 engine are motor-driven. Lube passes through a full-flow strainer and a pair of bypass filters, first a micronite paper filter, followed then by an activated clay filter.

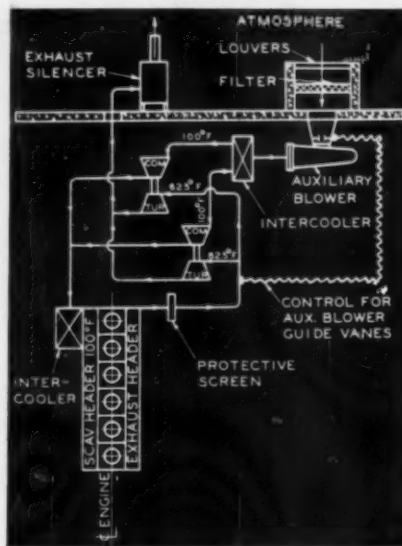
Plant efficiency and economy will continue to improve as growing demand increases the load on the three big engines. The population of Hudson has moved up from about 8,000 in 1955 to 10,000 in 1960 as more and more people moved out from Boston to "suburban" homes. But Hudson is far from becoming Boston's bedroom. This is a well-established industrial community which has added to its original shoe factories the manufacture of machine tools, plastics, textiles, and new electronics. At the same time, the domestic customer has been increasing consumption volume—from an average of 1600 kw hrs. in 1950 to 3119 kw hrs. in 1960.

The result has been growing power sales and higher peaks. The 1960 peak load, recorded on Dec. 19th, was 7300 kw and this is certain to be exceeded in the current year. Most of the time, the load can be carried by one or two of the Nordbergs, with No. 8 running around the clock and either No. 7 or No. 9 for about 16 hours.

The Hudson plant is as sound financially as it is in public service. In 1960, the department sold 28,142,995 kw hrs. and revenues totaled \$791,356.66. Net income after all expenses including interest and depreciation was \$184,149.36. It has been a regular practice to turn \$30,000 a year over to the city and use the rest as needed for capital improvements. It has been proposed that the cash

THE turbocharging system of the new two-cycle Nordberg described in the accompanying story is a matter of interest since it must be given due credit for the compactness of the powerful engine and for its partial-load efficiency. As shown in the schematic drawing below, scavenging air is drawn through a traveling screen filter to the suction of a motor-driven blower. The blower discharges through an in-

Schematic arrangement, engine, auxiliary blower and twin DeLaval turbochargers.

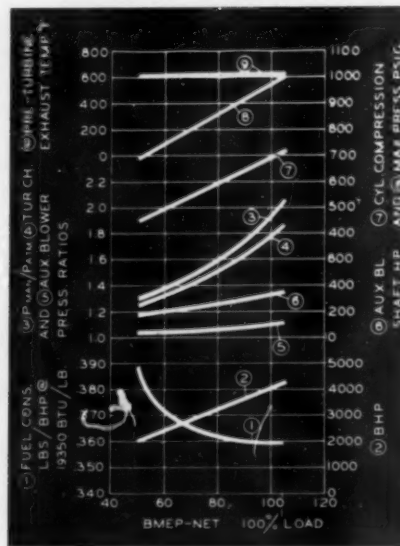


transfer be increased substantially. In addition, the plant installs and maintains street lights and provides current for street lighting according to a State formula that brings the price down to about half what the city would have paid a power company. Most important to the consumer is the service rendered. The plant is completely self-dependent and has compiled an enviable record of reliability.

The Light and Power Department is operated under the direction of Manager Thomas A.

Walsh with Chief Engineer Willard L. Allen in charge at the plant. The department is supervised by three elective officials, the Commissioners of Public Works: Chairman Charles J. Hellen, Argeo Cellucci, and Joseph L. Des Rochers.

Performance curves for engine, turbochargers and auxiliary-blower.



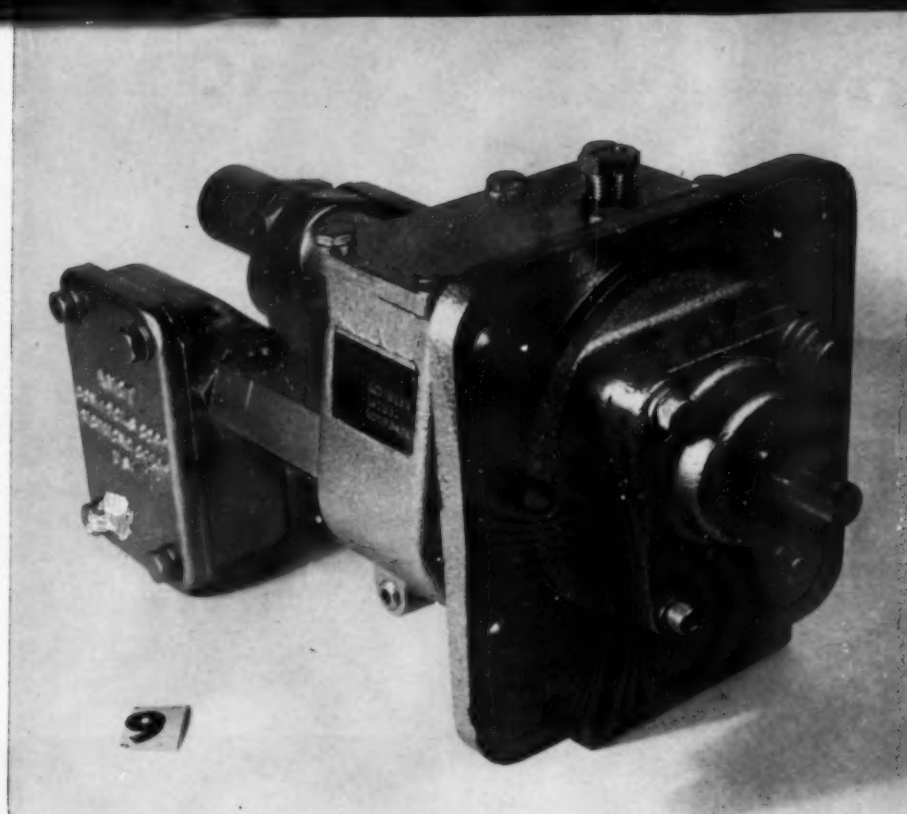
Walsh with Chief Engineer Willard L. Allen in charge at the plant. The department is supervised by three elective officials, the Commissioners of Public Works: Chairman Charles J. Hellen, Argeo Cellucci, and Joseph L. Des Rochers.

Principal Equipment Serving 4250 Hp Nordberg Turbocharged Engine

Generator	Westinghouse
Governor	Woodward
Turbochargers	DeLaval Steam Turbine
Intercoolers	Young
Blower	American Blower
Air filter	American
Fuel centrifuge	DeLaval Separator
Fuel filter	Nugent
Air controller	Bristol
Lube coolers	Ross
Lube filters	Commercial
Thermometers	Auto-Lite
Heat exchangers	Ross
Lube strainer	Andale
Cylinder lubricators	Manzel
Cooling water pumps	Pennsylvania
Engine panel	Nordberg
Exhaust pyrometer	Alnor
Gauges	Ashcroft
Switchboard	General Electric
Voltage regulators	Allis-Chalmers
Lube pumps	DeLaval Steam Turbine

TABLE I: Operating Figures, Nordberg 4250 Hp Supercharged Engine

	Engine Hours	KW Hrs. Generated	Average Load %	Total Fuel	KW Hrs. Per Gal. Fuel
April '60	86	174,200	67	12,552	13.87
May	575	1,232,300	71	87,906	14.01
June	226	366,600	54	27,270	13.44
July	69	116,100	56	8,977	12.93
Aug.	383	748,800	65	54,096	13.84
Sept.	472	905,000	64	65,658	13.79
Oct.	334	628,800	63	45,395	13.85
Nov.	211	396,300	63	28,741	13.78
Dec.	90	124,900	46	9,516	13.12
Jan. '61	209	341,100	54	25,154	13.56
Feb.	339	649,800	64	47,006	13.82
Mar.	476	949,200	66	68,445	13.86
Totals	3,470	6,633,100	64	480,716	13.80



SPEED ACTUATED VALVE FOR CONTROL, SAFETY SYSTEMS

AS engine, turbine and compressor applications become larger and more versatile, their control systems grow more complex and demanding. Automatically controlled or remotely supervised power units of several thousand horsepower are no longer unique in the internal combustion field. But within their control systems, particularly pneumatic, certain functions still challenge designers. One of these critical functions is the sensing of actual unit rotative speed, and its transformation into usable signal or force at predetermined set points. To fill the need for a speed-actuated device with a wide latitude of flexibility, Amot Controls Corp. is introducing a new control designated model 4017.

This unit utilizes a spring-loaded ball mechanism to displace one or two 3-way, balanced, non-overlap, high-capacity valves at individually set rotating speeds. A selection of valve ranges permits snap-action trip points between 1000 and 3300 rpm continuous. Where equipment is operated at speeds under 1000 rpm, a choice of two input speed increasers can be made, with ratios of 1:2.0 and 1:2.46. The design of the valve permits altering trip-point settings while the equipment is running; and settings on dual units are independently adjusted. To provide the strength necessary to withstand the exacting demands of heavy duty engine operation, the model 4017 uses a cast aluminum housing, machined aluminum valve bodies, cast iron mounting plate and precision-machined steel shaft and working parts. Anti-friction bearings and rotating ball assembly are fully lubricated by a self-contained reservoir or can be pressure lubricated from the driving equipment. These heavy duty bearings permit the unit to be gear,

cog belt, or chain driven, as well as connected through flexible couplings.

One of the unique features of the model 4017 is the design of the 3-way valve used for on-off or pilot service. Because of certain operational requirements of the control, no commercially available valve unit was found which could adequately perform in the required manner, and a special spool type valve was developed. Its specifications are: Simplicity—only one moving part easily replaced; low operating force; high flow capacity in minimum ($1/8$ in.) stroke; bubble-tight on pneumatic systems to 100 psi after 50,000 cycles; close-before-open operation so that control ports do not overlap in operation. For maximum flexibility of applications, Amot has provided the model 4017 with several optional variations and additions. The standard or basic control employs horizontal mounting, direct input with no speedup, a single valve with automatic return. Variations include: vertical mounting, a second valve, manual or pressure-operated valve reset, input speedup, and explosion-proof type electric snap switches which operate in conjunction with the valves. A separate model is also available using snap-switches only, for electric control systems.

Among the wide range of duties that can be performed by the 4017 speed valve are such functions as: (1.) Termination of starting sequence on automatic systems when the engine has reached idling or firing speed. (2.) Provide overspeed or

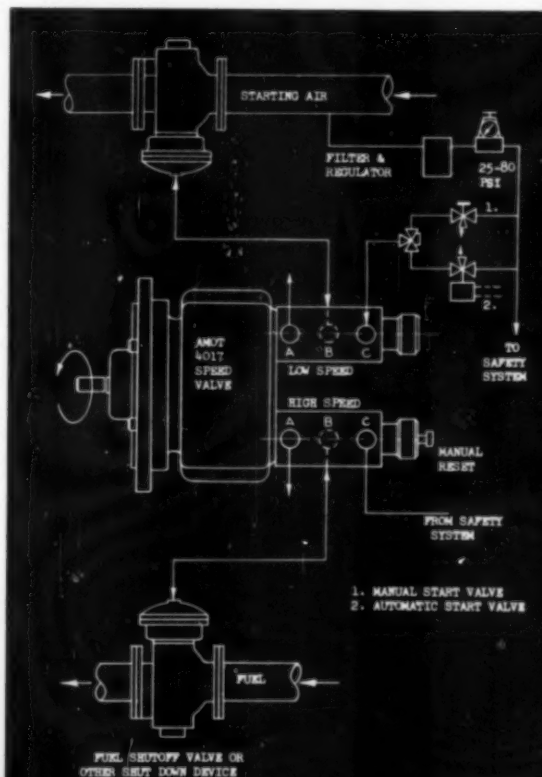
A basic application of the model 4017 showing a dual valve unit utilized in both an automatic starting and safety shutdown system.

Version of the flexible Amot model 4017 speed valve to which has been added a snap switch. This particular unit employs a 2.46:1 speed increaser input for slower speed engines.

underspeed shutdown in safety system. (3.) Employ Amot model 2400 indicating relays to indicate operation within specified limits. (4.) Energize fuel limiter on automatic start. (5.) Indicate when engine has reached minimal operating speed. (6.) Perform pilot duty on auxiliary process when engine reaches certain speed. (7.) Snap-switch modifications can ground ignition system at over- or underspeed conditions. They can also be used to tie-in with data transmission system to indicate an engine operating within desired limits.

For an application example, in the pneumatic circuit shown in the accompanying diagram, the model 4017 is used to shut off the starting air on an engine; and also to cut off fuel in case of an overspeed. A solenoid valve (shown as Item 2) represents a connection to a preferred electrical supply. When voltage drops or power fails, the solenoid valve will be de-energized directly or through a transfer switch. With the solenoid valve de-energized, control air will pass through the automatic selector valve, into C port of the low speed 4017 valve, and through to the starting air valve. When the engine has begun firing and reaches cutoff speed, the valve closes B to C and vents the start valve diaphragm through port A. A manual-start valve is represented by Item 1, and permits intentional or maintenance starts. The same functions may be accomplished by switches in the wiring to the solenoid valve.

The high speed valve on the 4017, used as an overspeed trip device offers the advantage that it cannot be blocked out of the safety circuit intentional or unintentional lockouts. A manual or pneumatic reset device may be added to either low or high speed valves to prevent automatic reset after an actuation. By the addition of other components, starting time limitation, repeat cycles and other functions can be performed, making this control a flexible system accessory.





OWNERS REPORT ON CAT'S NEW 220 HP TRUCK ENGINE

**Good Field Performances Attributed to Model 1673 Units
Announced a Year Ago As Some Vehicles Pass 100,000
Mile Mark in Variety of Haul Types**

INTERIM reports from users of Caterpillar's new series 1673 diesel truck engine indicate the engine is turning in good field performances. The 1673, a turbocharged, aftercooled diesel rated 220 hp at 2200 rpm, was fully described in our October, 1960 issue when Cat announced its availability. Since that time, the engine has been installed in a number of trucks and tractors throughout the country. These vehicles operate over every conceivable type of terrain and haul a wide range of gcw units. During this early period, Cat has maintained close contact with the users and installing dealers to keep tabs on how the new engine is performing in trucking service.

We had a chance to look at some of the reports filed by dealers on these early applications of the 1673 diesel engine. Comments run the gamut of points from low fuel consumption to lug ability, from absence of vibration at idling to smooth running at high speed, and plenty of power to match the application.

Of the firms that have thus far turned in 100,000 mi. on the new 1673 units, we have selected re-

ports on two that illustrate the use and performance covered in the interim reports.

Rock Transport Co. of Redding, Calif., use their 1673 engine in a Kenworth tractor that hauls double header, bottom dump trailers on a cement run five or six days a week and 24 hours a day. The unit was put on the road in January of this year and has operated almost continuously since. The tractor-trailer combination highballs from Redding to cement plants at either San Jose, a 606 mi. round trip, or to San Andreas, a 484 mi. round trip. At the cement plant, the combination is loaded with bulk cement to a gcw of 76,800 lbs., then heads back to Redding where it delivers that load, picks up empties and repeats the cycle. During the busy construction season, the unit delivers the cement directly to the job sites. Elevations range to 500 ft. in the run from the plant to Redding while they go as high as 2500 ft. when the cement is delivered to the job site. Grades are up to 4% on the plant-to-Redding run, but go as high as 6% to the construction site. Under these conditions, Rock Transport reports a favorable 5.7 mpg average in these 100,000 mi. The



only repairs required were replacement of an O-ring seal, a fan bearing and a brush holder and routine maintenance. Lube oil consumption, other than oil changes, was only 26 gals. During the first 100,000 mi., this Cat-powered Kenworth hauled about 44,550 tons of bulk cement and aggregate.

Another rugged application of the 1673 is made by Argo-Collier Truck Lines of Martin, Tenn., who have installed the Cat engine in an International-Harvester DCO-405 tractor. Argo-Collier operates a fleet of 101 refrigerated highway vans between New Orleans and Chicago. Christened No. 145, the 1673-equipped International was put on the regular run with the rest of the fleet.

DIESEL AND GAS ENGINE PROGRESS

Rock Transport, Inc., of Redding, Calif., uses this Cat 1673-equipped Kenworth tractor to haul double header, bottom dump cement trailers on round trips up to 606 mi. Unit has averaged 5.7 mpg in the 100,000 mi. traveled since installation of the 1673.

Argo-Collier Truck Lines of Martin, Tenn., has International-Harvester model DCO-405 tractor with Cat 220 hp engine. This unit has averaged 5.5 mpg on runs between New Orleans and Chicago with 59,000 lbs. gcw.

Paralleling the Mississippi, the truck operates in terrain ranging from low, flat river valley to the edge of the Tennessee Smokies. And parts of the route range from open highway to crowded city streets. Unit No. 145 makes the 1000 mi. run in two days, averaging 38 mph over the entire run with 59,000 lbs. gcw. Top speed is 58 mph, fully loaded.

Argo-Collier's Cat-powered tractor has turned in an overall 5.5 mpg on its run through the Central U.S. The drivers like the new engine because they believe the truck is easier to drive and the reduced



noise level adds to driver comfort. From the operational viewpoint, Driver O. R. Johnson said the unit "holds speed good on the hills. It's a smooth unit and operates in high gear most of the time."

The four cycle, six cylinder 1673 diesel engine is a 4.5 x 5.5 in. bore and stroke unit with a compression ratio of 18:1. When lugged down from 2200 rpm to 1700 rpm the torque increases 12 per cent which means less down-shifting.

Fitted neatly into engine compartment of I-H DCO-405 highway tractor, Cat 1673 required only modification of engine mounts for installation. Engine's Schwitzer turbocharger is specially built to Cat specs. Engine retains 220 hp rating to 7,300 ft.

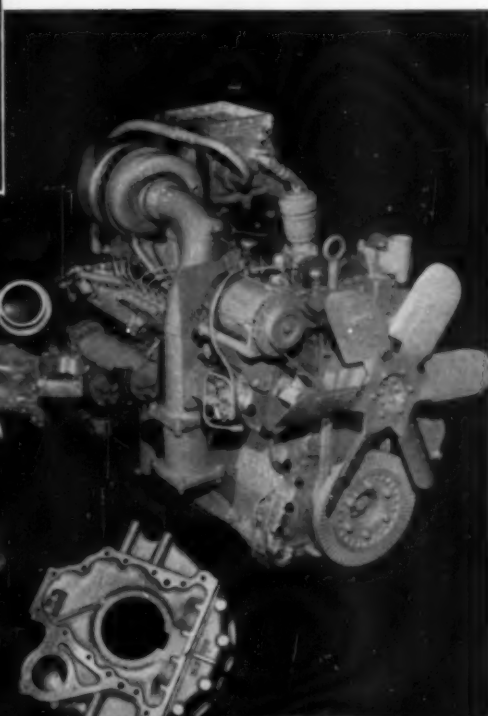
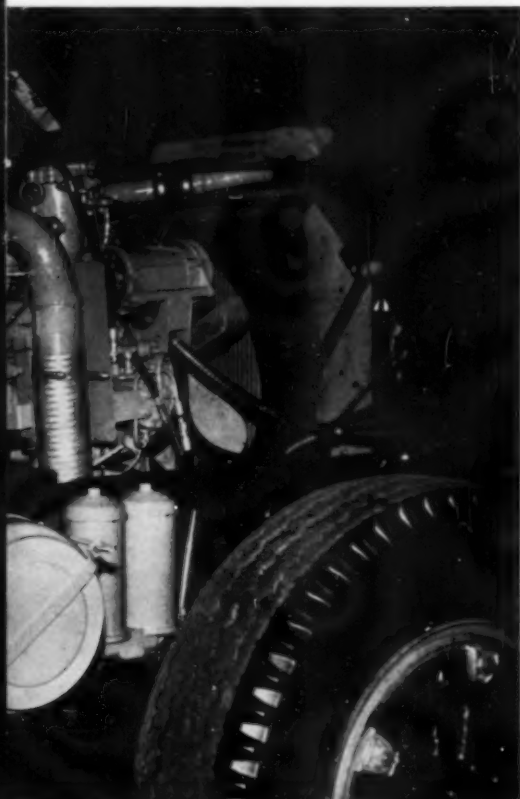
Extensive use of aluminum in non-stressed parts contributes to light weight of the 1673 for trucking service. Components include such items as flywheel housing, timing gear and fuel filter housings, oil pan and valve cover.

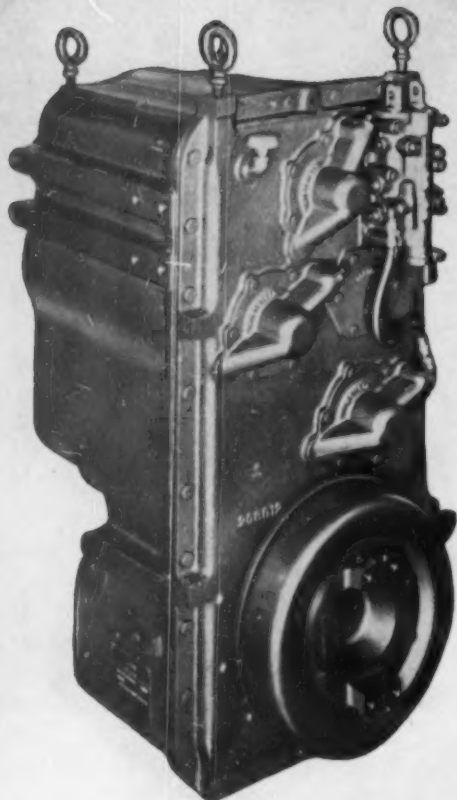
These turbocharged engines have a number of features that contribute to the good operating performances outlined above, not only on the engine itself, but in the turbocharger system as well. Particularly, several factors in the turbocharger design and turbo installation have contributed to good performance in this automotive type of operation.

Firstly, a newly designed Schwitzer turbo, built to exacting Caterpillar specifications, features a high speed, low inertia wheel assembly, rigid compressor housing and increased compressor wheel tip diameter, to boost turbo output and provide good response qualities, especially during acceleration. The turbocharger is isolated from outside loads by a rigid mounting to the exhaust manifold and a flexible coupling from the turbine inlet to the exhaust stack.

There are also some unique designs in the lubricating system for the turbocharger bearings. A spring loaded sequence valve delivers oil to the turbocharger bearings as the engine is started. As lube oil pressure builds up in the system, the sequence valve closes and oil is directed through the normal lube system. This setup protects the turbo bearings when the engine is started, particularly in cold weather conditions. Full flow oil filtration is employed on the 1673 and the sequence valve system does away with the need to pump up pressure to the turbo bearing lube oil passages after filter changes. Aftercooling, of course, also provides a denser combustion air charge allowing additional power to be taken out of the engine.

Thus, these factors of the high efficiency turbocharger with its rigid installation and lube oil and filtration system engineered for maximum turbocharger bearing life, combined with aftercooling to take fullest advantage of the turbocharging and reduce the temperature level throughout the engine all aim to provide good life and performance capabilities in the demanding service of OTR trucking.





HEAVY DUTY POWER SHIFT TRANSMISSION, U-JOINTS

Twin Disc Box Has Four Speeds Forward, Four Reverse for Material Handling Equipment Application; New U-Joints in 4,250 to 12,700 Torque Range for Heavier Duty Service

TO its steadily growing line of full power shift transmissions, Twin Disc Clutch Co. has now added the TD-44-1100 series. One of the first production prototypes of this new four-speed forward, four-speed reverse drop box was displayed at the recent Milwaukee SAE Heavy Duty Vehicle meeting. It is built primarily for use in front end loaders and graders in the 225 hp high-speed diesel range and will shortly be available in two models—the TD-44-1101 with an overall ratio coverage of 5.92:1; and the TD-44-1102 with an overall ratio coverage of 7.11:1. The new transmission follows the recently introduced TD-44-400 described in D&GEP June 1961. At the SAE show, Twin Disc also presented its four new heavy-duty U-joints which it is building under license agreement with GWB of Essen, Germany. These four joints, to be described later on in this article, have capacities from 4,250 lbs. ft., to 12,700 lbs. ft. rated static torque and are designed principally for application in heavy industrial and off-highway service above 250 hp.

The TD-44-1100 series transmission, which has full power-shifting ability in all speeds forward and reverse, is normally furnished with a 1500 heavy-duty Twin Disc sumplex, single-stage torque converter with a rotating housing. Maximum net input horsepower to the converter is 225 hp at 2100 rpm. This converter can mount either a single or a duplex pump for hydraulic circuits and is equipped with a pto for hydraulic pump drive. It also can be supplied with either rubber block or metal gear tooth input drive, and, if required, an optional governor drive. A pressure regulating valve and a filter for the converter circuit are standard. Also included as standard equipment is a speedometer drive.

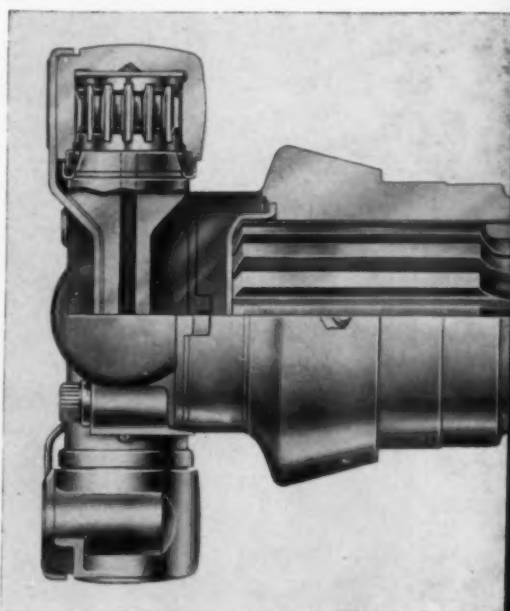
The transmission is of simple countershaft construction as illustrated with the constant-mesh spur gear trains actuated by three multiple-disc, oil-cooled, and hydraulically-actuated duplex clutches. Transmission clutch packs have been designated as follows: (1) high-low forward clutch pack; (2) high-low reverse clutch pack; and (3) high-low speed range clutch pack. Transmission valve assembly utilizes two main spools; one offers four speed selections by movement of the speed selector valve stem; and, the other forward, neutral, and reverse positions by movement of the directional control valve stem. This valve assembly

includes a separate oil pressure line to prevent range clutch downshifting when the directional control valve stem is placed in the neutral position. Another feature of this valve is the automatic shift to the neutral position whenever the vehicle brakes are applied. This is accomplished by connections to the vehicle air brake system. Clutches are duplex in design to conserve space. For immediate response, each clutch contains an internal valve mechanism which admits oil instantly providing a smooth, split-second shift.

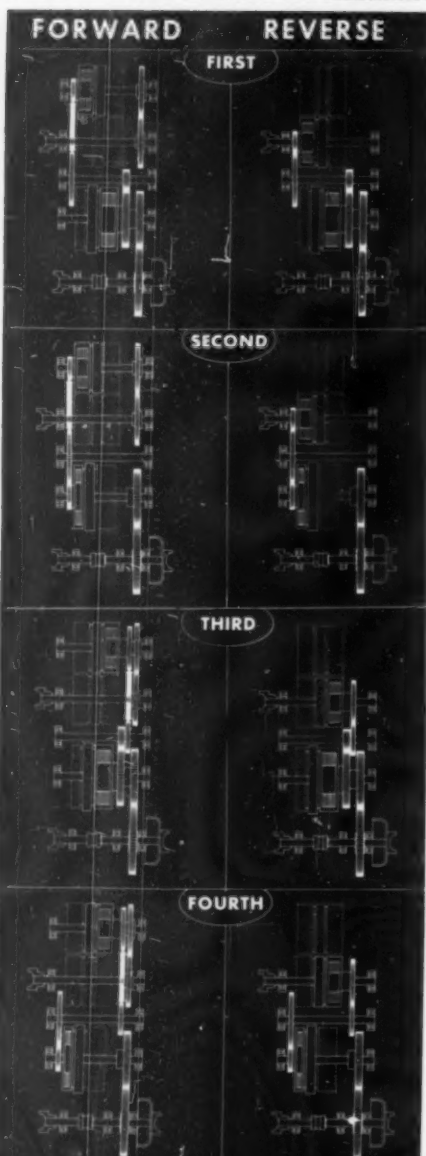
Input shaft and both ends of the output shaft are equipped with yoke-type universal joint connecting members as standard equipment. Also, a 13 in. parking brake and a disconnect jaw clutch are installed on the output shaft. The disconnect jaw clutch may be engaged for four-wheel drive or disengaged for single axle drive. These transmissions have been designed for easy servicing. Removing the main housing gives complete access to all clutches and range gears. Anti-friction bearings are used throughout. Here are the specifications:

Model	Forward & Reverse Ratios			
	1st	2nd	3rd	4th
TD-44-1101	3.90	2.16	1.19	.66
TD-44-1102	4.68	2.59	1.19	.66

Maximum absorbed engine torque by converter—



DIESEL AND GAS ENGINE PROGRESS



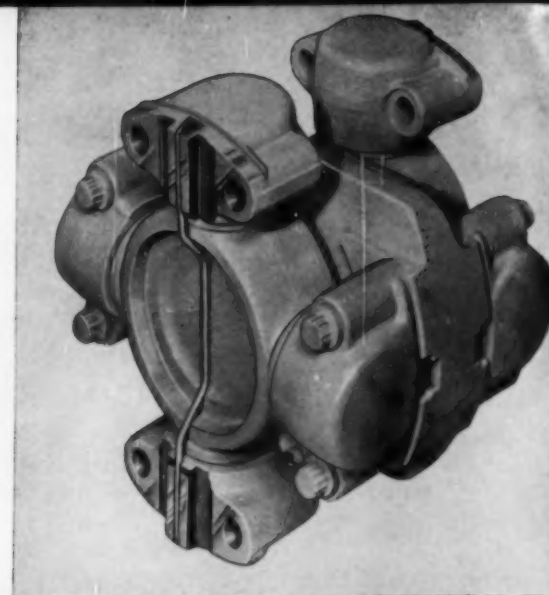
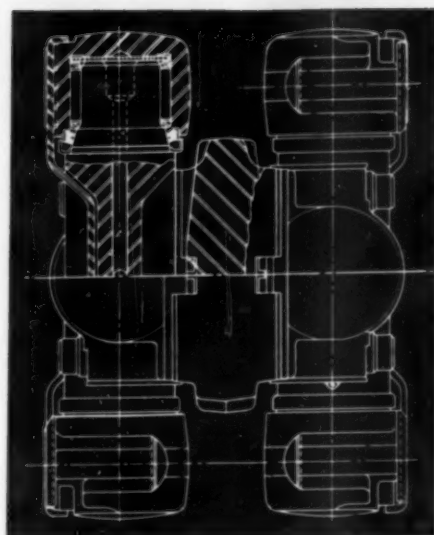
At top left is the new TD-44-1100 series full power shifting transmission. To left are diagrams showing the four ratios in both forward and reverse.

560 lbs. ft. Maximum converter output stall torque
—1790 lbs. ft.

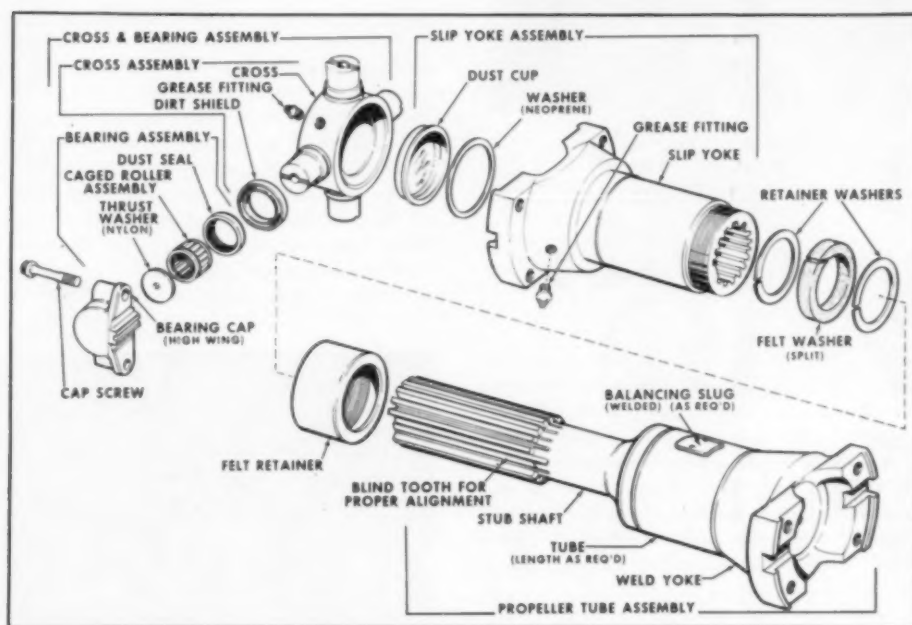
As stated earlier, the U-joints announced by Twin Disc are designed for the heavier duty applications such as diesel locomotives, rail cars, crawler tractors, off-highway haulers and the range of large industrial equipment. They will be built in four sizes—the J-230 and J-310 currently in production; and the J-170 and J-490 which will be available in early 1962. Torque ratings are:

Model	Maximum Operating Torque—Lbs. Ft.
J-490	12,700
J-310	8,400
J-230	6,100
J-170	4,250

The above are rated torques or that defined as



Above and to left are cross section and product views of the smallest universal joint in the Twin Disc line—the CP7. Section view shows tapered trunnion and nylon thrust bearing.



Exploded view of Twin Disc type TS double universal joint cross and bearing, slip yoke and propeller tube assemblies.

Cutaway view of model J-310, type TS U-joint now being built by Twin Disc under license from Gelenkwellenbau GmbH of Essen, Germany. Note use of large caged roller bearings.

45 per cent of static yield torque. There are five different types in each size and these are as follows:

Type TS—Consists of two U-joints coupled by a tube and integral spline connection. With slip provided in the type TS joint, mating yokes at the ends of the assembly can be axially fixed to the respective machinery components. Primarily designed for vehicles, type TS assemblies are also well-suited to industrial machinery installations where length is not a limiting factor.

Type T—Consists of two U-joint assemblies connected by a tubular shaft. Identical to type TS except that no slip is provided. Compensating

slip must be taken up in one of the yokes at the ends of the assembly.

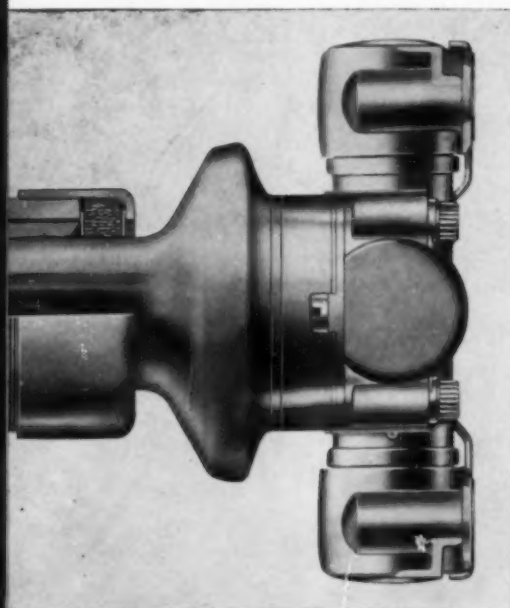
Type CS—Consists of two U-joints connected by a slip spline. Slip is provided in the joint assembly so that fitting yokes at the ends of the assembly can be axially fixed to the respective connecting components. One application for the type CS is in the center of all-wheel-drive vehicles with articulated steering (front and rear halves of the vehicle pivoting about a vertical center pin).

Type CP and CP7—Consists of two cross and bearing assemblies connected by a coupling plate. Compensating slip must be taken up in one of the yokes at the ends of the assembly. Primarily designed for front-wheel-drive installations and requires no grease-tight enclosure. Type CP7 is similar in construction, but designed to fit in an even shorter space.

Type CY—Consists of two cross and bearing assemblies connected by two yokes welded together. Compensating slip must be taken up in one of the yokes at the ends of the assembly. Applications include industrial machinery where the components ahead of and behind the U-joint are relatively close together.

All of the Model J series U-joints use bearings of the high wing construction as illustrated. According to Twin Disc engineers, this design with its longer cap screws provides excellent stress distribution plus a large diameter bore in the cap for the caged roller bearings which are used as standard. Wing type bearing design also provides for a light and very servicable assembly since companion flanges are not required and the centerline of the joint is close to the bearings in both driving and driven machinery.

All of the J series joints except the types TS and T may be operated safely up to 4000 rpm at 5° joint angle or less when balanced to production standards. Maximum operating speeds for the TS and T types are limited according to installed shaft length. Charts are available.



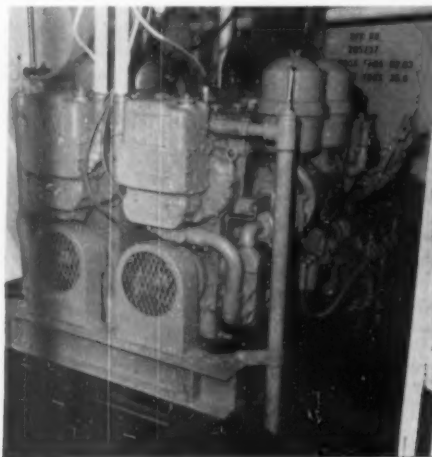


A pair of twin GM series 71, six cylinder diesels provide propulsion power for the *Marjorie Malloy*. The 64 ft. twin screw vessel was built by Livingston Shipbuilding Co., of Orange, Tex.

TUG, MARJORIE MALLOY

A NEW tugboat which incorporates some of the very latest and most modern developments in marine design and equipment was recently launched by the Livingston Shipbuilding Co. of Orange, Tex., for Anderson Petroleum Transportation Co. of Houston. The 64 foot vessel is a twin-screw, all-steel welded hull with a beam of 24 feet and was christened the *Marjorie Malloy* in honor of Mrs. Ed T. Malloy, wife of the president of Livingston Shipbuilding Co.

Motive power is provided by a pair of twin General Motors series 71, six-cylinder diesel engines supplied by George Engine Co. of Harvey, La. An interesting feature of the propulsion plants is that they are made up of twin industrial type engine units. Using an "O" type housing and a special



adaptor fitted to the drive flange, a Twin Disc model MG-512 reverse and reduction gear was installed on each engine unit to provide maximum speed reduction to the shaft. With 60 mm injectors, the engines have a planned operational speed of 1800 rpm and with a 6:1 ratio in the reverse and reduction gear, will have an efficient propeller speed of 300 rpm under typical working conditions while developing 295 continuous shaft horsepower through each twin unit.

The tug was designed and constructed with the dual objectives of providing maximum efficiency together with every possible device to insure the safety and comfort of her crew. Deck gear consists of two 40-ton winches at the port and starboard rails. These were designed and built by Livingston, using Tulsa worm gear speed reducers and holding brakes. There is also a pair of five-ton winches at center-line. These are used for centering the tug's bow with its tow. All of the winches are powered by model TMC-3 Denison hydraulic motors. There are nine such motors aboard, each rated 6 hp at 500 psi and 21.8 hp at 2000 psi. All are fitted with both local and remote controls. The latter are located on the pilot house control

◀ One of the pair of twin 6-71 GM diesels which power the *Marjorie Malloy*. With 60 mm injectors, the engines develop 295 cont. hp through each twin unit.

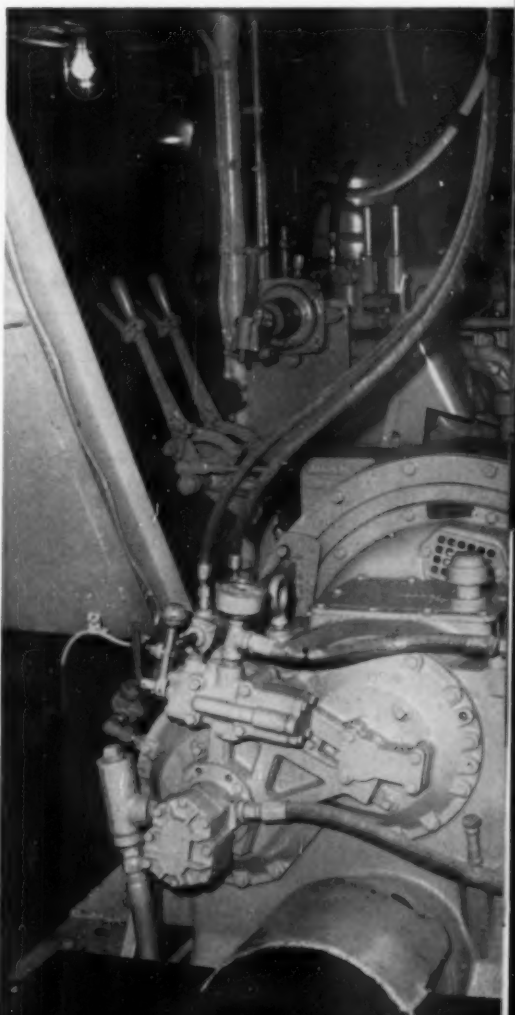
Twin Disc MG-512 reverse and reduction gear was installed on each GM twin unit, using "O" type housing and special adaptor fitted to drive flange. Gear has 6:1 ratio to drive propellers at 300 rpm. ▶

house panel, enabling the pilot to operate all winches individually from the steering position.

The engine room is laid out "big ship" style and is ventilated by two 4000 cfm blowers. All crew's quarters are air-conditioned. Additional comfort and safety for the crew is provided by interior passageways leading to all parts of the vessel. The navigation equipment is the most modern available and features a Decca model 218 Radar and an Apelco radio.

The vessel is equipped with a bilge flooding alarm system to warn the pilots, by means of a single light, when the bilge pumps should be started. Should this warning go unheeded and there is an additional rise of four inches in the bilges, a second light appears on the control panel. Simultaneously, a raccous buzzer sounds directly over the captain's bunk. If the water rises another half inch, a whistle sounds in the upper engine room.

The propellers were specially designed for their application by Prof. Louis A. Baier of the University of Michigan. Constructed by Avondale of stainless steel, each four blade wheel has 60 in. of diameter and 44 in. of pitch. The unusually wide hull design incorporates features to provide a high degree of maneuverability and control in the close quarters and shallow waters of the various channels and passages along the Texas intra-coastal waterways system. The exceptional beam made necessary the flexibility offered by the use of multiple engine units on each shaft to provide



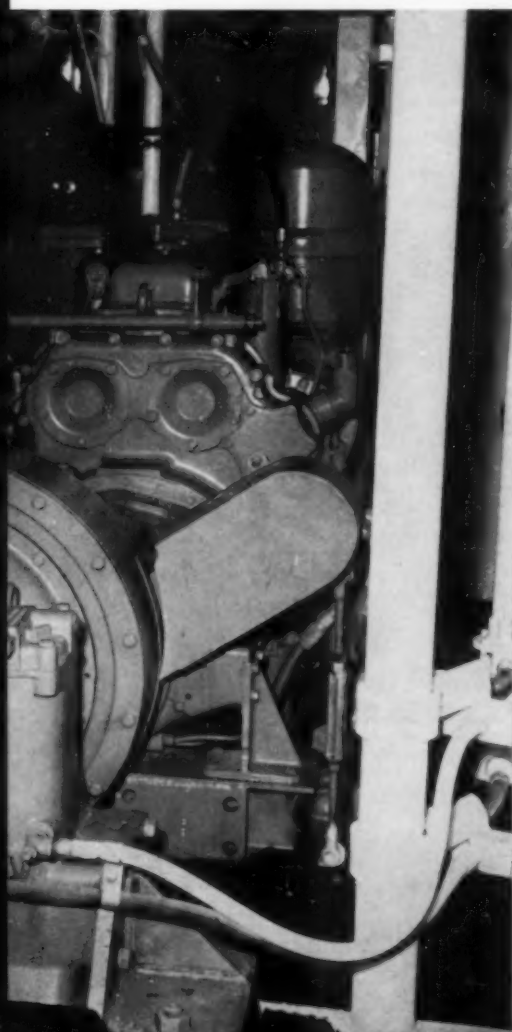
insurance against loss of effective steering control should a single engine failure occur.

Increased maneuverability was achieved through a combination of minimum hull length and draft with adequate propulsive power and a four rudder steering system of full follow-up design. In addition, outside dimensions of the lower and second deck houses were reduced to the functional minimum to greatly increase visibility from the high pilot house. This contributes to the convenience, speed, and safety of maneuvering the vessel and its tow in close quarters and also increase the vessel's stability and seaworthiness on larger open bays where strong winds and relatively rough waters are encountered. The depth of the *Marjorie Malloy* is a comfortable nine feet while her fully loaded maximum draft is seven feet six inches.

Electrical power is provided by two GM model 3-71 three-cylinder diesel engines driving 30 kw Delco generators providing 120/240 volt power.

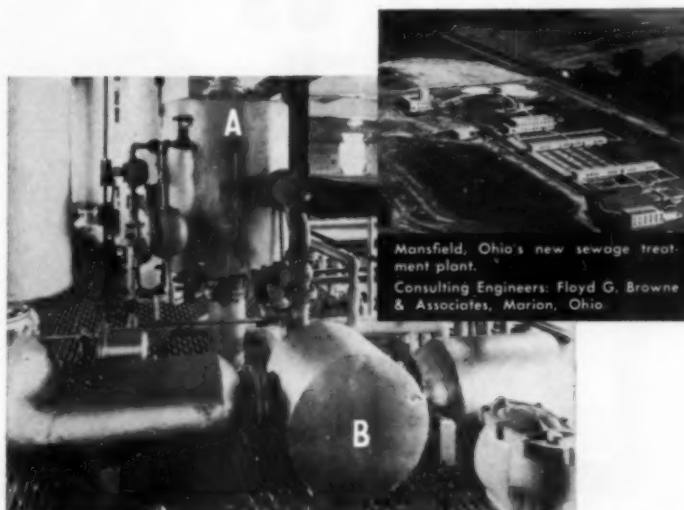
A rise in the upper engine room temperature of 20 degrees in one minute automatically activates a CO₂ smothering system. The system can also be activated manually at a trip station on the forward deck. Ventilating fans are automatically shut off by pressure switches at the instant the CO₂ system comes on.

Tow rope dynamometer tests during trial runs gave a reading of 18,000 lbs. pull at 1700 rpm on the engines.



HOW VAPOR PHASE CUTS COSTS

at Mansfield, Ohio's New Sewage Treatment Plant



A — Vapor Phase Steam Separator. B — Vapor Phase Exhaust Heat Recovery Exchanger.

Vapor Phase is the engine waste-heat conservation system that supplants conventional cooling methods and provides heat for application to many useful purposes. At Mansfield, each of four Climax V-123 engines driving Roots-Connorsville blowers are equipped with Vapor Phase Steam Separators and Exhaust Heat Recovery Exchangers. Here are some of the resultant economies:

FUEL COSTS CUT ON BLOWER ENGINES

Vapor Phase cools these engines with STEAM . . . Steam separators permit use of available raw sewage gas as fuel without danger of engine damage . . . save thousands of fuel dollars annually. Steam from separators plus additional steam from Vapor Phase Exhaust Heat Recovery Exchangers provide the heat for sludge digesters and for buildings.

MAINTENANCE COSTS CUT ON BLOWER ENGINES

By "cooling" with steam, the engines can operate at a higher temperature which results in a more efficient engine and cleaner combustion. Jacket water and cylinder wall temperature differential is lower which reduces stress and wear. Less water is formed by condensation, reducing the amount of acids and other contaminants.

SLUDGE DIGESTERS HEATED AT NO COST

Vapor Phase supplies quantities of steam needed to operated sludge digester heaters. Surplus steam is used to help heat buildings.



Vapor-Phase Steam turbine driven fan condensers condense excess steam.

INVESTIGATE NOW WHAT . . . VAPOR PHASE WASTE HEAT RECOVERY SYSTEMS CAN DO FOR YOU



ENGINEERING CONTROLS, INC.

An affiliate of St. Louis Shipbuilding & Steel Co.

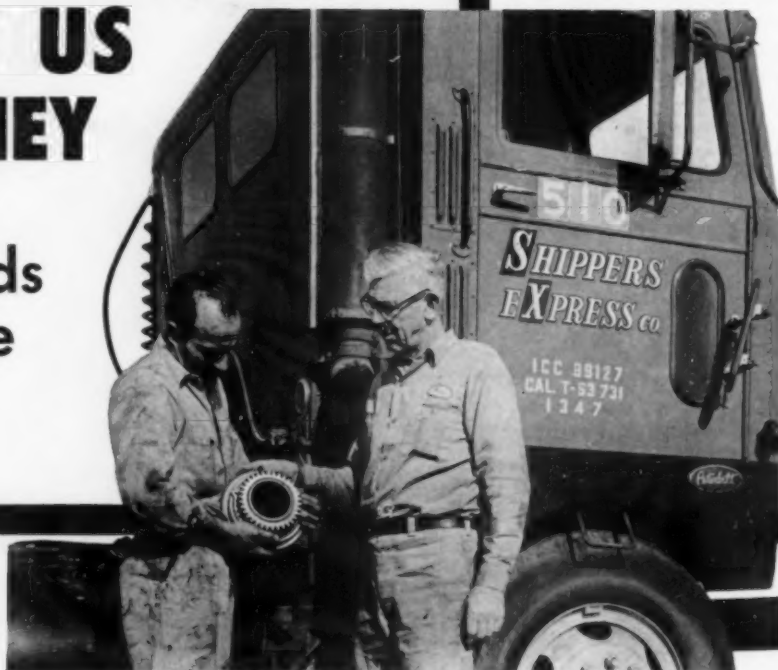
611 E. Marceau

St. Louis 11, Mo.

"SPICER COMPONENTS

SAVE US MONEY

...Our
Records
Prove
It!"



C. W. McClurg, right, maintenance superintendent at Montebello terminal, shows mechanic Fred Curtiss that range synchronizer and clutch gear from Spicer 12-speed transmission is in perfect condition after 160,000 miles of service.

"We specify Spicer components," says C. W. McClurg of Shippers Express Co., Montebello, California, "because our experience, our maintenance records prove they're the most rugged, the most trouble-free we've ever used!"

"We specify Spicer components in our new trucks, and we insist on Spicer replacement parts. We know Spicer has helped keep our road failures 'way down! And, believe me, we keep records that show right to the penny what our operating costs are. We stick to rigid preventive maintenance schedules.

"Another reason we specify Spicer—the availability of replacement parts everywhere we operate. From San Diego to Los Angeles to San Francisco Bay area to Sacramento—our rigs operate day and

night, many of them over mountains with grades of 6 percent, and everywhere we go we know we can get Spicer parts. This is one of the best ways we know to cut down-time.

"We specify every Spicer component we can possibly use—14 inch 2-plate clutches, 12-speed, 5-speed and 4-speed transmissions, 3-speed auxiliary transmissions, 1700-series universal joints and propeller shafts. And our maintenance records show Spicer prop shaft assemblies give us up to 400,000 miles before rebuilding is necessary. We get up to 300,000 miles on Spicer clutches before rebuilding, and the gears in Spicer transmissions generally last about 500,000 miles.

"The use of Spicer components fits in ideally with our cost-saving maintenance program. I base this statement on my 25

years' experience in the trucking business."

About Shippers Express Company . . .

"We operate 210 pieces of equipment," says Mr. McClurg. "This includes 17 three-axle rigs in our long-line equipment, 13 three-axle heavy duty trucks for local dispatching, 10 two-axle cab-overs, and 40 two-axle tractors for local deliveries.

"Shippers Express Company was founded in 1926 by A. D. Woolley, who is now chairman of the board. C. R. Hart is president and R. E. Woolley is vice-president and general manager. Our home office is in San Jose, California."

SPECIFY SPICER components for trouble-free operation, low maintenance cost, availability of replacement parts. For information on Spicer products write Dana Corporation, Toledo 1, Ohio.



DANA

SERVING TRANSPORTATION—Transmissions • Auxiliaries
• Universal Joints • Clutches • Propeller Shafts • Power Take-Offs
• Torque Converters • Axles • Power-Lok Differentials • Gear
Boxes • Forgings • Stampings • Frames • Railway Drives

CORPORATION

Many of these products are manufactured in Canada by Hayes Steel Products Limited, Merritt, Ontario Toledo 1, Ohio



**COSTLY DUST PROBLEM
SOLVED BY
DRILLING COMPANY
WITH PUROLATOR
2-STAGE DRY-TYPE
AIR FILTERS**

Four ruined diesels prompt quick switch to Purolator 2-stage dry-type filters with built-in double protection.

"A lot of abrasive silica dust passed right through our old single-element filters and completely ruined four drilling-rig diesels," reports Emil McConnel, New Jersey Drilling Co. VP.

"The extra protection offered by a second filter element sold us on the idea of switching to Purolator 2-stage air filters. Performance has been completely satisfactory. These filters now protect all our motive equipment."

Why Purolator 2-stage filters give complete protection.

Purolator's 2-stage air filters offer extremely high performance because they contain two Micronic® filter elements — each operating independently. If one element should get out of order, the other keeps on removing 99.98% of all contaminants. Harmful abrasives never get into the engine—no matter how dirty the job.

Easy, quick maintenance.

Servicing the 2-stage filter takes only minutes. After housing cover is removed, used element is lifted out and replaced with a new one. First-stage element lasts up to 2,000 hours. Second-stage element should last almost indefinitely.

For complete details on the 2-stage, dry-type air filter, write: Purolator Products, Inc., Dept. 7137, Rahway, N. J.

First-stage Micronic® element of Purolator 2 stage air filter being replaced by New Jersey Drilling Co. Foreman, Dick Hompesch. One of the nation's biggest drilling outfits, New Jersey Drilling uses Purolator 2-stage filters to protect all its motive equipment.

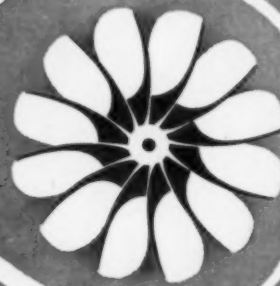
Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, CANADA

GAS TURBINE PROGRESS



A MONTHLY SUPPLEMENT TO DIESEL AND GAS ENGINE PROGRESS REPORTING ON NEW DEVELOPMENTS AND APPLICATIONS IN THE TURBINE POWER FIELD

AiResearch Gas-Fired Turbines Will Drive High Frequency Generators

AiResearch Manufacturing Co. of Arizona, a division of the Garrett Corp., was chosen as prime contractor to provide one of the first commercial, compact, natural gas-fired system to generate high frequency electrical power for lighting, and steam for heating and air conditioning for an office building. The new system, using Westinghouse electrical components, is for Northern Illinois Gas Company's new west-central division headquarters at Glen Ellyn, Illinois about 20 miles west of Chicago. AiResearch will make two natural gas-fired turbines which will drive high frequency generators. These will provide all the electricity used in the building, and the exhaust gas from the turbines will be utilized to make steam for heating and cooling. Construction of the office building will start within the next few weeks and it is scheduled to be occupied in about one year.

Ground Support Unit Passes Air Force Test

The United States Air Force has completed review of the results of a recent company sponsored endurance test of Boeing's gas turbine-driven compressor. Two of Boeing's ground support compressors successfully completed endurance tests which have been in operation around the clock for seven weeks. One compressor unit completed 5,000 consecutive starts and stops and a second unit has completed 500 hrs. continuous operation. The two compressors, each mounted in the rear of a panel truck, were operated side by side on an outdoor test stand at Boeing. The endurance and cycling tests were run by Boeing to military specifications covering ground support equipment. The two engines were torn down and inspected by both Boeing and United States Air Force personnel. Based on these tests, Boeing is considering plans to continue running the units to establish the life of the engine and its accessories. The Boeing turbine compressor used in these tests is a new model designated the 502-11BA (commercial designation 502-12B). This model is similar to the earlier compressor but includes

new design features such as turbine wheels with mechanically attached blades, a newly designed nozzle box and higher-strength higher-temperature materials in engine "hot parts." All Boeing gas-turbine engines use a common gas-producer section, which means the improvements will appear in shaft power as well as in compressor versions of Boeing engines.

Lycoming, Piaggio Sign Gas Turbine Agreement

An agreement covering the manufacture of Lycoming T53 and T55 gas turbine engines in Europe has been signed by Avco Corp.'s Lycoming Division, Stratford, Conn., and Piaggio & C., Genoa, Italy, it was announced by James R. Kerr, president of Avco and Armando Piaggio, managing director of the Italian firm. Under the agreement the two companies will combine the production facilities of Piaggio and the engineering, sales and service organization of Lycoming. Piaggio has been producing Lycoming reciprocating engines under a license arrangement.

Research on Dust Wear

With the increasing importance of gas turbines in military strategy, determining the wearing effects of dust and dust concentrations in various parts of the world has become a matter of urgency. Southwest Research Institute's Environmental Research Section, headed by Robert Engelhardt, is in the process of tracking down dust storms. Natural dust storms, however, are not the primary concern of Environmental Research. The section's personnel are interested rather in dust conditions that are the result of man-made conditions. The job in the environmental laboratory is to predict just how much dust will be raised by military and civilian equipment operating under conditions of varying severity in various parts of the world. The second part of the job is to predict the amount of wear and damage the dust will do to equipment. This work is performed by the Automotive Products and Equipment Research Department. The abilities of the Mineral Technology section are also used to evaluate the abrasive properties of various types of dust.

Turbines To Power Minesweepers

Clark Bros. Co., has been designated prime contractor by the U. S. Navy, Bureau of Ships, on a 1.6 million dollar contract to design and build four gas turbine generators for magnetic minesweeping service. The gas turbines are rated at 1480 kw each and will be geared to dc pulse generators. They will be installed on minesweepers to supply current to large cables towed behind the ships. The current-carrying cable creates a magnetic field that explodes mines at a safe distance. Each turbine will be mounted directly above the generator and will drive it through a vertical offset speed reducing gear.

Turbine for Checkout System

Solar Aircraft Co. has received an order for gas turbine-powered generator sets for a new electronic preflight checkout system developed by Republic Aviation Corp. The generator sets, powered by Solar's Mars 50 hp gas turbine engine, insure a continuous supply of high quality electrical current for the precision checkout system. The electronic system, dubbed RADFAC (radiating facility for aircraft flight line testing), permits Air Force fighter pilots to give their planes a complete electronic checkout in 90 seconds without moving from the cockpit. Republic designed the system for use with its F-105 D Thunderchief jet fighter bomber, but it may be modified for use with other aircraft. Solar's generator set and controls supply current for the unit or monitor the current supply when an outside source is used. In the event either the voltage or the frequency of the current supplied by the outside power source should fluctuate beyond established limits, the Solar-furnished controls cut off the outside current supply and start the gas turbine.

Missile Generator Order

A \$3 million Army contract for small gas turbine generator sets for the Sergeant missile has been announced by The Garrett Corp.'s AiResearch Manufacturing Division, Phoenix. The 30 kw sets supply all power to aim, fire, and guide the mobile Sergeant ground-to-ground missile, built by Sperry-Utah, Salt Lake City.

GAS TURBINE POWER FOR STANDBY SET

By W. L. BODE

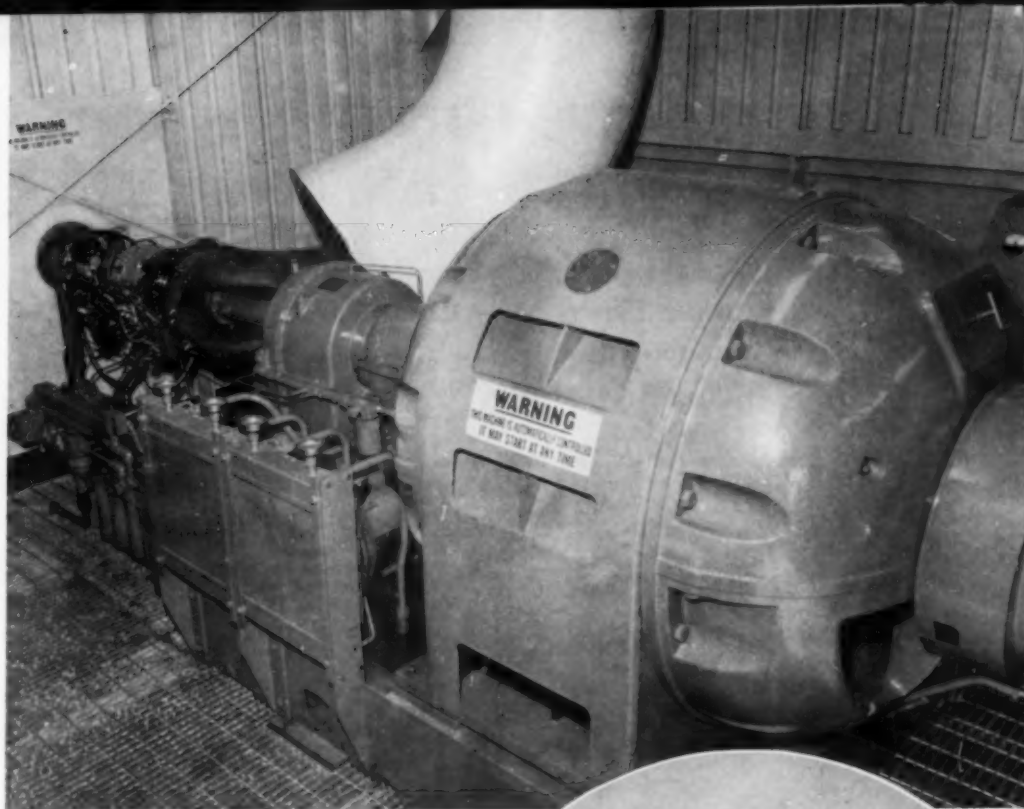
An emergency industrial gas turbine-generator unit light enough for rooftop installation yet capable of supplying communications power for a city of 70,000 has been installed by Pacific Telephone & Telegraph Co. at its Oakland, Calif., exchange facility.

The new 750 kw stand-by powerplant, according to Pacific Telephone officials, provides a supplementary source of power for emergency operation of its downtown Oakland facility. Ability to install the unit on the roof of their exchange building influenced Pacific Telephone in its decision to use gas turbine power. The unit selected, General Electric's model 720 gas turbine generator set, weighs 12,235 lbs. The 320-lb. G-E gas turbine has a rating of 1,000 max. cont. shaft hp at power turbine speed of 19,500 rpm. Other components of the all-G-E package include speed reducing gear, engine control panels, switchgear and base for the unit.

Specifications for the ac synchronous generator call for a continuous 750 kw, 4,160 volt output and the capability of producing 825 kw overload. The generator on the Oakland installation operates at 4,160 volts so as to greatly reduce the size of the power leads to the basement. In the basement, this voltage is transformed to 208 volts so as to operate the unit in parallel with existing diesel units. Total kw capacity of all these units is 1,650. Two engine control panels are used, one at the unit and another at a master control center for remote operation.

Mounted on the steel sub-base, along with main components is a starting battery, battery charger, oil tank and air-oil heat exchanger. Tanks for storage of kerosene or No. 1 diesel fuel are positioned nearby. A free-standing switchgear cubicle completes the installation.

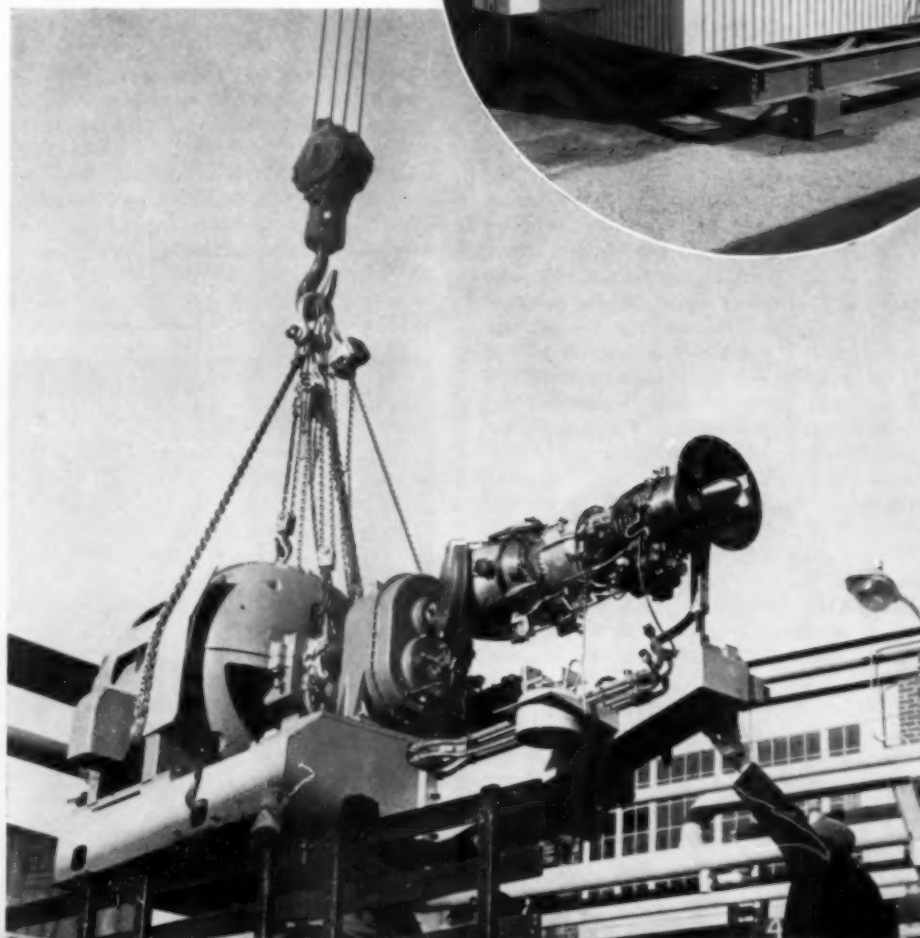
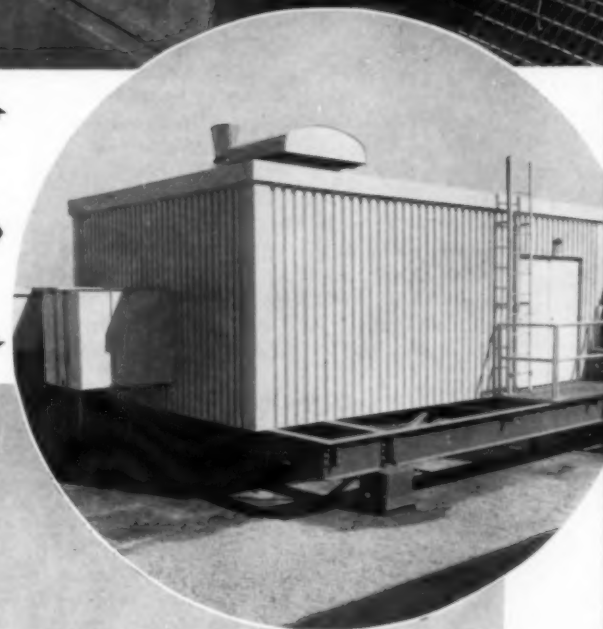
The high speed GE reduction gear furnished with the model 720 engine has a ratio of 16.25:1. It accepts the 19,500 rpm output shaft speed of the model 720 engine and reduces it to 1200 rpm for the generator set. The flexible couplings of the gear torsionally isolate the engine from the gear, and in turn, the gear from the generator load. The flexible coupling on the high speed shaft is balanced for high speed and assures positive gear alignment. The high speed and low speed gear reductions are both of helical design to assure a maximum number of engaged teeth and quieter, more efficient operation. The reduction gear drives a lube service and scavenge pump. Force-feed lubrication passages are machined into the gear casing to keep external piping to a minimum.



GE model 720 gas turbine drives 750 kw generator for standby power at Pacific Telephone & Telegraph Oakland office. Unit can produce 825 kw overload.

Turbine-generator set is housed in special penthouse atop phone company's 15-story building.

The turbine-generator package weighs 12,235 lbs. Gas turbine is rated max. 1000 cont. shaft hp at 19,500 power turbine rpm.



NEW FUEL CONTROLS FOR INDUSTRIAL GAS TURBINES

Units for Turbine Engines in The 50-600 HP and 1000-20,000 HP Classes Designed and Developed By Woodward Governor Co., to Meet Objectives Of Low Cost, Light Weight and Long Life

*By F. W. NEWBURGH and B. INGOLD**

POSSIBILITIES of wide application of the gas turbine engine for industrial and commercial purposes have only recently been generally recognized. Until this time, the gas turbine almost exclusively has been an aircraft prime mover and as a result has been designed for extremely light weight. When it became evident an important market was to be realized for the gas turbine engine in industrial uses, we felt redesign of our aircraft gas turbine fuel controls would not be sufficient. Work was started on three industrial fuel controls, two of which we describe here.

The first is our type 1945, for engines in the 50-600 hp class. Its basic design goal was low initial cost, with life and weight as secondary objectives. As it turned out, the concept was simple enough that light weight resulted without much effort. This same simplicity provides a unit with long life, especially in clean fuel.

The second is our type 1910, for engines in the 1000-20,000 hp class. Its basic design goal was long life, so the control is highly biased by diesel governor practice.

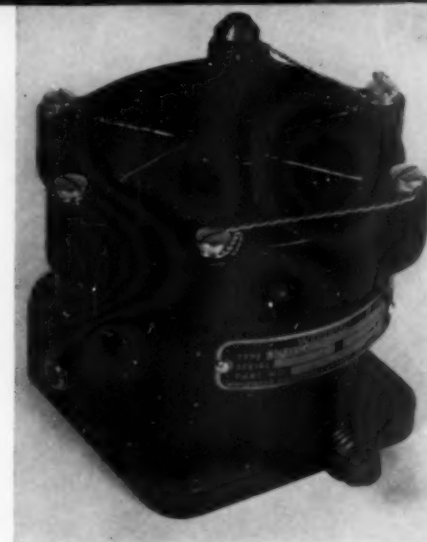
The gas turbine is a continuous combustion machine. As a result, it must take in about four times as much air for internal cooling as it does for combustion. This excess air is available for combustion if fuel is supplied. A simple governor, which knows only speed, is quite willing to send fuel pump output to the combustion chambers, should engine load increase. This can melt the turbine blades. Should a large decrease in load occur, and the governor is required to decrease fuel, it will do so as quickly as possible, and unless its action is stopped in some manner, will completely shut off the fuel until the new requested load is reached. In the meantime, of course, the fire will have gone out.

A gas turbine with a free turbine for power extraction has a special problem. An increase in horsepower is not obtained just by increasing fuel flow and turbine temperature as in a constant speed single-shaft machine. Free turbines absorb

additional load by requesting more speed from the gas generator. As the gas generator speed increases, air flow increases and free turbine torque increases. The free turbine can use a simple governor, but the gas generator needs acceleration and deceleration fuel limits in its fuel control.

Even in relatively simple low-compression ratio gas turbine engines, some method of holding fuel flow to a maximum and a minimum limit is necessary to avoid high temperature and no fire problems. This control job is rather easy on engines which have low compression ratios, say up to 5:1, and which stay at low altitudes, say up to 8000 ft. The governor can be stopped from sending too much fuel to the combustion chambers by adding a variable restriction to the flow in the governor circuit. Reducing fuel too much can be prevented by adding an adjustable stop to the governing valve such that it cannot completely close and will allow sufficient fuel to maintain engine fire. Our type 1945 uses this principle.

High compression ratio machines present a more difficult acceleration and deceleration fuel flow control problem because if a stage of compression is running at a speed much off of its design speed, it does not want to pump air. The stage ahead of it may be less critical, and will continue to send air. It is possible to have a stage of the compressor, or a series of stages, stop pumping.

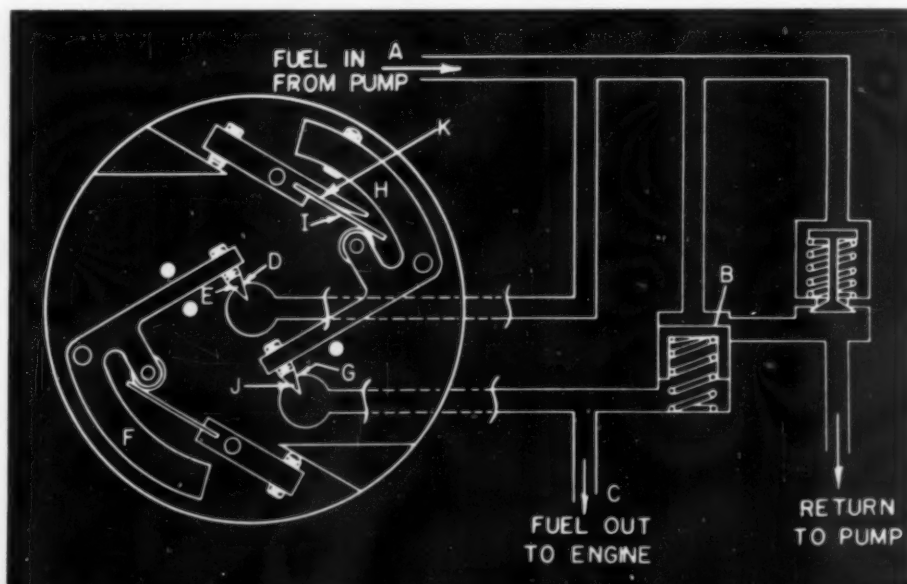


Woodward's type 1945 gas turbine fuel control.

In this condition, called compressor stall, the high pressure at the end of the compressor can cause the air to flow back out of the front of the engine. This event is particularly spectacular when the flame shoots out the engine inlet, and can be somewhat distressing to a nervous operator. The point of the game is to control the fuel-air ratio. This implies that the fuel control must know air flow so that it can proportion the correct fuel flow. Because of the disadvantages of direct measurement of airflow, the fuel control senses other engine parameters and computes air flow. The most important is compressor discharge pressure (cdp). Many engines will satisfactorily accelerate on fuel proportional to cdp alone. If a more correct airflow computation must be made, compressor speed and compressor inlet temperature can be measured. Fuel controls for high compression ratio gas turbines perform the necessary calculation and position a fuel valve to maintain acceleration and deceleration fuel flows within limits until the speed governor is satisfied. This is the principle our type 1910 uses.

Now let's go back to the simple control for low compression, low altitude gas turbines. Shown above is the type 1945. It is about 3 in. high, about 3 in. in diameter, and is designed for mounting either on the top of a pump or independently.

Figure 1. Schematic of type 1945 gas turbine fuel control.



*Manager, Auxiliary Controls Dept., and Sales and Service Engineer, respectively, for Woodward Governor Co. From a paper presented at the SAE "Heavy Vehicle" meeting, Milwaukee.

It contains five moving parts as shown in the schematic (Fig. 1).

Fuel flows into the control through port A. The bypass valve B maintains an essentially constant pressure drop from the inlet to port C, the discharge to the engine nozzle. A relief valve as shown protects the fuel pump from excessive pressure. Should we add restrictions between port A and port C, the bypass valve will open, more fuel will be bypassed back to the pump, and less will be sent on to the engine. As you may have suspected, we do add restrictions. One is at D, and is varied in size by needle E, which is moved by a governor weight, F. To govern, the governor weight moves out, needle E partially restricts the flow through D, the pressure drop increases, and the bypass valve, B, returns more fuel to the pump. Another restriction is in series with D at G. This hole is varied in size by speed weight H working against leaf spring I. At low engine speed, the needle J restricts the flow to the engine to starting fuel levels. As speed increases, the needle gradually moves out of the restriction G, permitting more fuel to flow to the engine. When the requested speed is reached, the speed governor weight moves needle E into restriction D, thereby further reducing engine fuel flow to maintain governed speed.

When small load changes tend to change engine speed, the governor weight will move needle E in and out of the restriction to permit a little more or a little less fuel to flow to the engine combustion chamber to produce the heat energy necessary to maintain the requested speed. Should a large decrease in load occur, the governor weight will sense the resultant increase in engine speed, and will close the restriction until the energy of the fuel supplied just matches the energy needed to maintain speed at the new load.

In order to provide a sufficient spring load with spring I for the centrifugal force of weight H to work against over the wide speed range a relatively simple cam device as shown at K was employed. With this, the effective spring scale is changed as a function of flyweight position. The position of needle J therefore can be made linear with speed. Fuel flow to accelerate the engine is preset by selecting the proper contour of needle J.

Maximum horsepower limiting is accomplished by the screw adjustment which limits travel in flyweight H, and thereby flow. Minimum flow is set by positioning needle J with flyweight H against its low speed stop and needle E with flyweight F against its high speed stop. Variable speed setting of the governor section was not considered here because of the cost penalty it would impose on the users of a fixed, single speed unit. It will be added as necessary.

At this time, life testing of the 1945 control continues (over 500 hrs.) and units are gaining running time at engine manufacturers' facilities. We are reviewing all drawings prior to putting the 1945 into production and expect to have more units available for testing later this year.

The type 1910 concept is of a self-contained oil-lubricated computer section with an output shaft

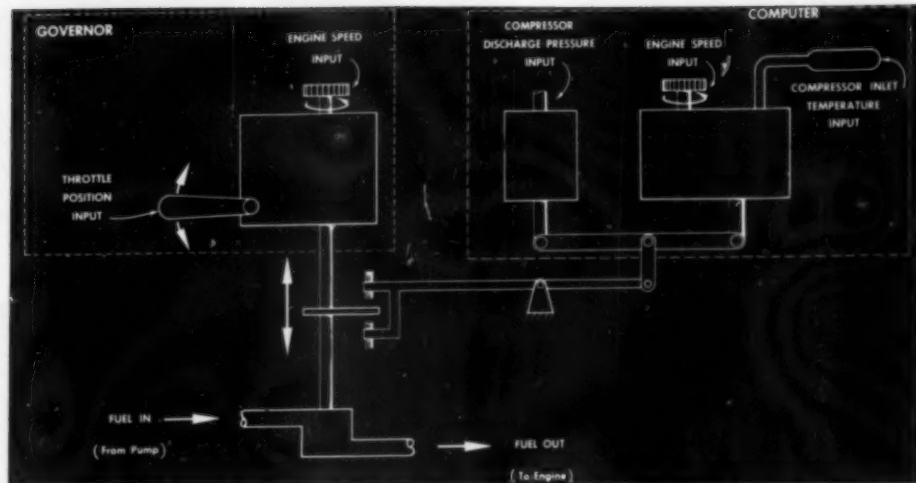
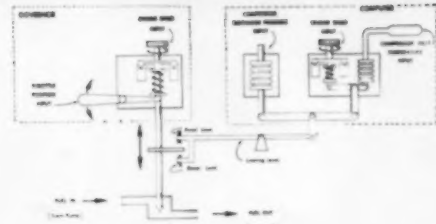


Figure 2. Block diagram of 1910 fuel control.

Figure 3. Schematic of Woodward type 1910 control.



which can be used to position either a liquid or gaseous fuel metering valve. We intended that the computer package be designed for use with adapters for mounting the control to various engines in the 1,000-20,000 hp class and that the adapters can contain special equipment for use on only one engine.

A block diagram (Fig. 2) of the 1910 shows an all-speed governor which is limited by a lever which is positioned by cdp, rpm, and cit (compressor inlet temperature). The output of the combination moves a fuel valve to regulate the amount of fuel which is sent to the engine. A simple schematic (Fig. 3) shows the throttle which positions a spring which applies a force against a set of flyweights. When the engine speed causes the weight force to overcome the spring force, the output rod will move to reduce fuel to the engine. Should the operator ask for more power by moving the throttle to increase the spring force, the flyweight force will be overcome, and the output rod will move to increase fuel flow. On a large load demand, it is quite possible that the output rod would move in the open direction until it hit against the adjustable movable stops in the limiting lever. Then the maximum allowable fuel valve opening is determined by compressor discharge pressure, compressor inlet temperature, and engine speed output linkages. Should cdp increase, as during an acceleration, the bellows will expand, the righthand side of the limiting lever will be raised, and the acceleration limit screw will permit the governor to move the fuel valve to increase engine fuel flow. When the new requested speed is reached, the governor will take over and close the fuel valve.

The output of the cdp bellows is connected to a logarithmic cam, as are the speed and temperature functions. The computer output is actually connected to an adding link which has two such cams as its inputs. In the type 1910, we rotate this cam with speed, and slide the follower across the cam with temperature. We believe the cam

in the type 1910 will help make the job of cam changes in the field a lot easier, should such changes be desirable due to the normal improvement of an engine.

Turbine compressor inlet temperature is sensed by a gas-filled probe which produces a force proportional to temperature. This force is balanced by a spring which is loaded as the cam followers move across the cams. Compressor discharge pressure is sensed by a bellows which produces a force proportional to pressure.

Throttle movement rotates a cam which sets the force output of the governor speeder spring against the governor weight force. An isochronous governor makes space available to change to a droop-type governor should a particular application make this desirable.

A typical free turbine application would find the requested power turbine speed and actual speed being compared by a governor which sends an error signal to the throttle shaft of the gas generator control. The gas generator would then accelerate or decelerate until the engine airflow provided the requested free turbine speed. The computer would act in the normal way to protect the gas generator during the speed transition. The free turbine governor can be chosen from a series of standard industrial governors including simple droop, isochronous, and load sensing types; depending on the transient load characteristics and requirements.

Evaluation testing of the 1910 control continues with two units available. Room temperature runs for accuracy are still being conducted. Current study may result in minor changes to improve accuracy. Engine runs probably will not be made until early next year.

West Coast News

By James Joseph

ABUILDING by Shepherd Machinery Co., Whittier, Calif., 8000 gal. water distributor units combined with Caterpillar DW-20s or DW-21s, the four spray units designed for earthmoving, compaction, sanitary fills or firefighting.

TO Western-Gillette truck lines, 50 additional White-Perkins in-town compact van trucks, combining White's new 1500D cabover tractor with Perkins' Six-354D engine, 120 hp at 2800 rpm.

DEMONSTRATED in Los Angeles: Hyster's new C-500A rubber-tired compactor with Caterpillar D-311-H, 75-hp at 2400 rpm engine.

TOMMY Imamura, Gardena, Calif., has repowered his Peterbilt tractor with a Cummins NH-220.

FOR Mira Loma Hospital, Lancaster, Calif., a Caterpillar D-397 diesel-electric standby developing 300 kw.

INSTALLED: in Tom Merino's 20 ft. lapstrake cruiser a Perkins four-99 die-

sel (33 hp at 3300 rpm) and Muncie 500-Series outdrive, the dual inboard-outboard set-up by Fellows and Stewart, Wilmington, Calif.

FOR Chino, Calif.'s I.W. Brooks, a Continental TD-6427 diesel, 140-hp at 2400 rpm, for lower truck of a Gradall crane. Sale by Industrial Engine Sales, Los Angeles.

A 4 cylinder, 68 hp Osco Ford diesel marine engine has been installed in Frank Ford's new 46 ft. steel motor sailer, bound for world-around cruising. Installation by Fellows and Stewart, Wilmington, Calif.

TO Ringsby Truck Lines, Inc., for expanded California service, 50 White-Freightliner single drive tractors with Cummins NH-220 diesel engines and Fuller 5-W-74 transmissions.

SOLD to American Vitrified Products Co., Duarte, Calif. a Cummins JN6-B1 (130 hp at 2500 rpm) engine to repower a Gerlinger carrier. Sale: Cummins Service & Sales, Los Angeles.

COAST Rock Products Co., Santa Maria, Calif., has repowered a Northwest shovel with a Cummins HR-6-IP (175-hp at 1800).

FELLOWS and Stewart, Wilmington, Calif. has installed an Osco Ford 68 hp direct drive engine swinging 14 in. prop in a 20 ft. trailered lapstrake speedboat—for offshore Pacific cruising.

TO Kaiser Steel Corp., Fontana, Calif., first of four conversion Cummins JN6-B1 units in Ross straddle carriers. Sale by Cummins Sales & Service, Los Angeles.

New Exchanger Line

A new line of standardized compact heat exchangers has been introduced by Basco, Inc. Designated as type 500, the exchangers are available with shell diameters from 3¼ in. through 8¼ in. and in lengths from 1 ft. 4¾ in. through 6 ft. 7 in. Use of ferrous materials for shells, connections and bonnets forms an exceptionally strong and durable structure that withstands pressure surges and the corrosive action of synthetic oils and hydraulic fluids. Basco's type 500 units are designed to meet heating and cooling requirements in the engine, compressor, turbine, hydraulic equipment, machine tool, light marine, and process industries where fluid temperatures must be closely controlled with a compact, ruggedly-built exchanger. One, two and four-pass models are carried in stock for immediate shipment. Complete information may be obtained by requesting Bulletin F-1161 from Basco, Inc., 345 Payne Ave., North Tonawanda, N.Y.

ITS NEW

DIESEL AND GAS ENGINE PROGRESS



The new special alloy steel spring in Perfect Circle's chrome OS89 heavy-duty oil ring is offset in a channel next to the drainage slots, instead of being directly behind them.

As a result, drainage is completely unobstructed by the spring, and clogging is reduced to a minimum.

And, this amazing new spring is made of 3 interwound coils. The unique design makes possible great strength and durability in a smaller diameter. There's also a greater area of contact with the ring all the way around for more uniform pressure, greater conformability and less friction.

Only Perfect Circle has this new type of ring that reduces clogging for better oil control in heavy-duty engines.

For an informative booklet on the new OS89, contact your PC supplier or write to Perfect Circle, Hagerstown, Indiana.

PERFECT CIRCLE
PISTON RINGS • POWER SERVICE PRODUCTS
HAGERSTOWN, INDIANA • DON MILLS, ONTARIO, CANADA

THE DOCTOR OF MOTORS
Skilled mechanics the world over prefer and install Perfect Circle piston rings.



Fleet Sales Manager

On the heels of its recent entry into the truck manufacturing business, Marmon-Herrington has appointed Thomas M. Hoban as fleet sales manager of its new Heavy Duty Tractor Division. Hoban will have complete responsibility for sales of the new 14,000 lb., over-the-road vehicles, which are custom-built to accommodate a variety of diesel engines and optional equipment. Its new trucks are currently on road test in the fleets of large common carriers.

Distribute Yanmar Line

Stewart & Stevenson Services, Inc. of Houston has been named Texas and Louisiana distributor for a line of lightweight industrial and marine engines manufactured by Yanmar Diesel Engine Co., Ltd. Designed primarily for auxiliary power uses, the Yanmar engines are available in 2-15 hp models, and feature either air or water types of cooling systems. Compact, versatile and lightweight, the units can be used in marine work to replace gasoline auxiliaries on diesel propelled vessels, take over the auxiliary loads and release the full power of the main engine for propulsion service, and meet a variety of other auxiliary power requirements. In industrial application, the engines are suitable to power generators, pumps, blowers and air conditioning units. Smallest model in the line weighs 76 lbs. and develops 3 hp.

Enterprise Joins A.D.S.

Enterprise Engines, Division of General Metals Corp., has become the first manufacturer of diesel engines to be admitted to the Association of Diesel Specialists. In the affiliation with A.D.S., Enterprise will furnish Association members with up-to-date specifications and service information on its engines and the Association's service members will provide the proper timing application and service for the equipment they repair.

Vice President—Research

Promotion of N. John Beck to Vice President—Research was announced recently by E. Don Tull, President of Cummins Engine Company, Inc. In his new capacity, Mr. Beck will be responsible for advanced engine and component development, engine design, and applied research. Since joining Cummins in February, 1959, he has served as Director of Advanced Design and Development in the Company's Research Division.

A 1947 graduate of the University of Colorado, Mr. Beck received a Master of Science Degree from California Institute of Technology in 1948 and earned the

Ph.D. Degree from the University of Wisconsin in 1952. From 1948 to 1953 he was associated with General Motors research in the area of diesel and gas turbine design and development. From 1953 until he joined Cummins in 1959, Mr. Beck was employed with Douglas Aircraft Company, where he served as Chief Propulsion Engineer for the Long Beach Division.

Group Engineering Director

Leonard J. Linde has been appointed director of engineering, Industries Group, Allis-Chalmers. Previously, he had been director of engineering services since August, 1960. He will be in charge of the overall administration, review and coordination of Industries Group research and development.

AVAILABLE NOW! The completely new 1961 edition of the **DIESEL AND GAS ENGINE CATALOG**, Volume 26, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 608 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover and costs just \$10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG**, 10850 Riverside Dr., North Hollywood, Calif.

WHEN MOTOR OIL FLOWS THROUGH THIS NEW FRAM "WEAR-GUARD" OIL FILTER



UP TO 40% MORE ENGINE-KILLING SLUDGE IS TRAPPED!

Tests using radioactive tracer techniques proved it! An exclusive scientific breakthrough in the construction of new Fram "Wear-Guard" Oil Filters traps up to 40% more sludge than any other filter tested. Give your engines this extra margin of safety. You'll find a type and a model of Fram "Wear-Guard" Filter to meet all your operational requirements. Fram Corporation, Providence 16, R.I.

FRAM

"WEAR-GUARD" FILTERS

F-M Diesel Orders

On its bid of \$448,680, Fairbanks, Morse & Co. has been awarded a contract to furnish the City of Sebring, Fla., a diesel generating set. Sheldon K. Howard, director of marketing, said it is an 8 cylinder, 2,800 hp slow-speed generating set—the third identical Fairbanks-Morse model and the sixth F-M

engine ordered for the Sebring plant. A. H. Heim, general manager of the Fairbanks, Morse hydraulic and compressor group, said that a \$192,000 order had been received from the Donna Irrigation District, in the Rio Grande Valley, near McAllen, Tex., for three 36-inch pumps and three 7 cylinder Fairbanks-Morse opposed piston diesel engines to drive them.

Cooler, Condenser Catalog

A revised horizontal cooler and condenser catalog, has been issued by Young Radiator Co. The 16 page, 2-color catalog contains complete information on horizontal core, air cooled heat exchangers for the cooling and temperature control of oil, water and gases or for condensing vapors. The re-

vised copy describes the efficiency, economy and versatility of the units and illustrations of typical applications point out their durability. The structural features of various cooling sections and available cores are illustrated and described. Required information for recommending HC units and a unit nozzle selection chart are included. For a copy of Catalog No. 561 write Young Radiator Co., Racine, Wis. **ITS NEW**



Alnor Pre-Turbocharger Excess Temperature Alarm

*measures the exhaust temperature
as it enters the Turbocharger*

Prevents overheating of the turbocharger by sounding an alarm if exhaust exceeds the set safe temperature.

The Alnor Pyrotac with a temperature range up to 2000° is employed in this alarm system and is actuated by a thermocouple inserted in the exhaust pipe at the entrance to the turbocharger.

If the exhaust temperature reaches the danger point and the alarm is sounded it is necessary to manually reset the Pyrotac thus making it impossible for

the operator to ignore the danger signal.

This alarm system is inexpensive to install, 100% reliable and offers full protection for the turbocharger.

This Pyrotac is the same sensitive, rugged instrument now used extensively on most Diesel installations for checking the efficient operation of the power plant by monitoring the exhaust temperature of each cylinder.

Alnor has specialized on diesel malfunction alarm systems since 1926.

Flash Evaporators

An improved 50,000 gpd sea water distilling plant of the four-stage low temperature flash type, first of six being built under a U. S. Navy contract, has been completed by Badger Manufacturing Co., Cambridge, Mass. The unit is the first ever built under new Navy specifications which allow use of U-tube bundles in the condensers rather than conventional straight tubes. This specification change, in addition to others originated by Badger designers, has resulted in one of the lightest and most compact flash evaporators for its capacity yet produced. It weighs 18 tons and measures 16 ft. long x 11 ft. wide x 10 ft. high. One of the features of a flash distilling plant is the fact that it can be used with any installation where there is a large quantity of waste heat, such as in a diesel engine installation. In this case, the heat rejected by the engine jacket cooling water can be used together with heat recovered from the exhaust gases. When using the jacket water heat only, it is possible to get approximately 1½ gph of fresh water product per bhp. Thus, a 1000 hp engine when operating at full load will produce 500 gph with a four stage distilling plant by using the waste heat from the jacket only. It is possible to step this up to approximately 750 gph by using the exhaust gas heat as well. The evaporators (built for the Navy) are designed to function automatically with only routine checks by an operator. Each is equipped with an automatic electronic salinity control which guards against contamination of the fresh water product. The production run tests now being conducted at Badger indicate that the evaporators will provide better than the 3.75 lbs. of distilled water per pound of steam supplied. When actually installed on shipboard, the steam supply will come from the auxiliary exhaust steam from the main turbine at 15 psi.

AVAILABLE NOW! The completely new 1961 edition of the **DIESEL AND GAS ENGINE CATALOG**, Volume 26, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 608 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover and costs just \$10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG**, 9110 Sunset Blvd., Los Angeles 46, Calif.



ALNOR INSTRUMENT CO.

Division of Illinois Testing Laboratories, Inc.

Room 508 • 420 North La Salle Street • Chicago 10, Illinois

Australian Reefer

The first Freighter Industries refrigerated van with Perkins-engined Transicold equipment has just been put into service in Australia. The Freighter/Trailmobile insulated van is owned by the transport firm of G. N. Blomfield Pty Ltd., of Red-Hill, Victoria.

The unit has been operating on 1300 mi. trips to Brisbane, carrying 15 ton loads of perishable goods. The Transicold refrigeration plant is fitted with a four cylinder 1.6 litre Perkins Four 99 diesel engine, rated for this purpose at 23.5 bhp at 2,000 rpm. The engine is mounted on shock absorbers and hung from brackets beneath the van. Transicold units are designed to idle when a pre-selected load temperature is reached, but never shut down completely. A speed control solenoid, chain connected to the engine's governor, idles the engine to 1100 rpm when cargo temperatures reach pre-selected limits. When additional refrigeration or heat is required, engine speed is stepped up to about 1900 rpm. Cargo temperatures are maintained to plus or minus half a degree. Further Perkins-powered refrigeration units are to be built in Australia during the year by Freighters Ltd. The Australian company is associated with Trailmobile Inc., of Cincinnati, Ohio, who produce the trailers in the United States.

Engineering Manager

William W. Smith has been named manager of engineering and development of The Electric Storage Battery Company's Nickel-Alkaline Battery Division, West Orange, N. J., succeeding J. Donald Moulton who retired at the end of the year. Mr. Smith was manager of alkaline battery development in the engineering department of ESB's Exide Industrial Division, Philadelphia, for the past five years.

Electric Welder Caution

For the sake of convenience, the practice still persists of quickly starting heavy equipment by connecting it to an electric welder, reports the service department of International Harvester's Construction Equipment Division. Ingenuity here has ignored an important detail—current developed by the electric welders may be as high as 110 volts, while starting voltage on construction equipment units is much less. Although no damage may be evident after one emergency boost by an electric welder, it is certain to manifest itself, in serious form, with additional applications. Glow plugs have been known to melt because of the powerful welder current,

and large quantities of headlights, starting motors, generators, regulators and ammeters will have to be replaced after continued reliance on the electric welder as a starting aid. The convenience of a quick start can be obtained, in much more practical fashion, by keeping the engine in tune, with a full charge in the batteries. Modern diesels always respond to this treatment.

New Plant for Sealed Power

Paul C. Johnson, president of Sealed Power Corp., announced that the company plans to build a new casting and machining plant in the Muskegon area. The new plant will cast and rough-machine cylinder sleeves with particular emphasis on sleeve liners for aluminum engines. Presently, the company is fur-

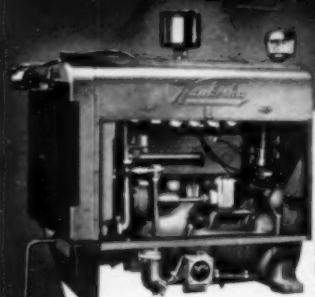
nishing a major producer of engine blocks with this product for use in one of the leading car producer's aluminum engines. The new plant building will contain about 50,000 sq. ft. of floor space with the new structure planned to most effectively accommodate the company's new manufacturing processes and techniques. Initial investment will be about \$1,500,000.

**You can't BEAT
this EXPERIENCE**

**over 30 years
proven top performance by**

**WAUKESHA
GAS
ENGINES**

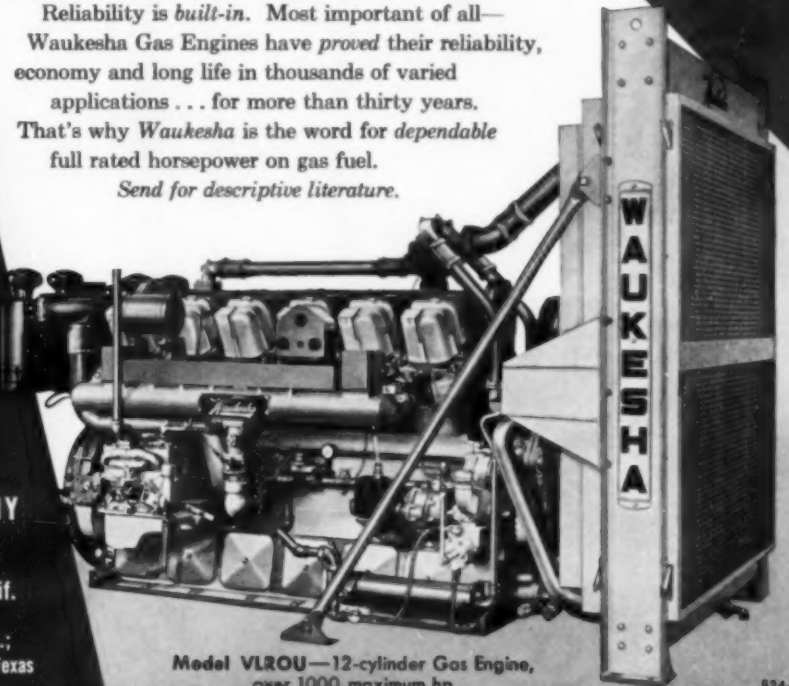
**throughout
the world**



**Model
XAHU**
Long Life Unit,
21 continuous hp

It's easy to pick a gas engine that's really "tailor made" to your needs. Get a Waukesha *designed-for-gas* engine! Then you can be sure—before you buy. The Waukesha gas engine line is *complete*. You can get exactly the right engine. The Waukesha combination of *designed-for-gas*—and built-for-gas construction features, and first quality materials—that means low fuel and lubrication costs—is the result of Waukesha's over fifty years' experience in building fine engines. Reliability is *built-in*. Most important of all—Waukesha Gas Engines have *proved* their reliability, economy and long life in thousands of varied applications . . . for more than thirty years. That's why *Waukesha* is the word for dependable full rated horsepower on gas fuel.

Send for descriptive literature.



**Model VLROU—12-cylinder Gas Engine,
over 1000 maximum hp**

**10 to
1027 hp**

**61 to
5788 cu. in.
displacement**

**WAUKESHA
MOTOR COMPANY**

New York • Tulsa
Huntington Park, Calif.

Factories: Waukesha, Wis.;
Clinton, Iowa; Houston, Texas

824-G

New Gasket Compound

A new easy-to-apply gasket compound is available for leakproofing, gasketed assemblies. It also can be effectively used to repair broken gaskets, for building up damaged, misaligned or warped flanged surfaces, or as a gasket substitute where surfaces permit. Seal-Last, the new gasket compound can be used for a

wide variety of industrial fluids and gas services, including water, steam, oil or water-based hydraulic fluids, L-P and natural gases, petroleum products, mild corrosives and many chemicals. Temperature range is from -65° to +400° F., pressures to 5000 psi. For complete information contact Crane Packing Co., Dept. DP-6, 6400 Oakton St., Morton Grove, Ill.

ITS NEW

ROBERTSHAW ENGINE CONTROL SYSTEM

COMPLETELY PNEUMATIC

Monitors All Points, Performs All Functions

Robertshaw's fully integrated system gives you the exact operational functions you need . . . engineered and packaged to your requirements.

Whatever the size of your installation or the degree of control desired, you'll find Robertshaw's one-source responsibility provides highest efficiency and maximum safety, coupled with minimum cost.

Details? Gladly!—in our Free Catalog VD-J. Send for it today.

Robertshaw

Robertshaw-Fulton Controls Company



FULTON
SYLPHON
DIVISION

Knoxville 1, Tennessee

Details? Gladly!—in our Free Catalog VS-J. Send for it today.

Michigan-Ohio News

By Jim Brown

R. G. Moeller Co. of Detroit reports sale of a John Deere model 1010 (¾-yd. bucket) crawler loader powered by a John Deere diesel engine. The new loader will be used to remove rubble on a demolishing project, the 14 story Majestic building in Detroit. It will be crane-lifted to the 14th floor of the building and as that floor is demolished it will scoop up the rubble and dump it down the elevator shaft. After the 14th floor is demolished it will be moved to the 13th and subsequent floors, until the project is completed. Arrow Wrecking Co. of Detroit are handling the demolishing project.

C. R. Taylor Sand and Gravel of Fennel, Mich. has accepted delivery on an International TD-9 Drott 4-in-1 tractor. The sale was made by Wolverine Tractor & Equipment Co. of Detroit.

A Pettibone-Mulliken model 60 "carry-lift" crane (60-ton) was sold to Great Lakes Steel Co. of Ecorse by Cyril J. Burke Inc. of Detroit. The new crane is powered by a Cummins diesel engine (195 hp) and will be used to handle steel slabs, ingots and other items around the plant.

R. L. Coolsaet Construction Co. of Dearborn, Mich. has accepted delivery on an International TD-15 (151 series) crawler with a Superior SBI-150B side boom. The new crawler will be used on underground excavation projects and was purchased from Wolverine Tractor & Equipment Co.

TWO Michigan model 380 tractor-dozers powered by GM 12V-71 diesel engines were recently delivered to Holloway Construction Co. of Livonia, Mich. Distributor is Miller Equipment Co. of Livonia.

MICHIGAN Tractor and Machinery Co. of Detroit has sold a Caterpillar model 1673 diesel engine (220 hp, turbo-charged, after-cooler) for installation in equipment owned by Service Equipment Rental of Grand Rapids, Michigan.

CASE model 750 crawler powered by a model A-301DR Case diesel was recently delivered to Chevrolet Flint Mfg. Co. of Flint, Michigan. The new crawler is fully equipped with winch and other accessories and was purchased from J. R. Panelli Equipment Co. of Southfield, Mich.

THE Missaukee county road commission has accepted delivery on an International TD-15 crawler with hydraulic

bulldozer. Sale was made by Wolverine Tractor & Equipment Co.

JOHN Deere model 1010 with backhoe was recently delivered to Macson's Inc. of Pontiac, Mich. for excavation work. Sale was made by R. G. Moeller Co.

WOLVERINE Tractor & Equipment Co. reports sale of an International model TD-25 with hydraulic bulldozer to William J. Muchlenbeck, Inc. of Saginaw, Mich.

PIERSON Construction Co. of Saginaw, Mich. has accepted delivery on an Allis Chalmers model HD6E with an AC model 6HS hydraulic dozer blade. Distributor is Earle Equipment Co.

MOTOR City Excavating Co. of Dearborn, Mich. has accepted delivery on a model H-50 Hough Payloader powered by an International UD-282 diesel engine. Sale was made by Wolverine Tractor & Equipment Co.

A model K608L Link Belt crane (3-yd.) powered by a GM 6-110 engine was recently delivered to Great Lakes Steel Co. of Ecorse, Mich. Link Belt distributor is Miller Equipment Co.

WESTON Trucking Co. of Fargo, Mich. has accepted delivery on a Hough H-70 (rated at 2½-yd. capacity) powered by a JN-6-BI Cummins engine. Wolverine Tractor & Equipment Co. is local Hough distributor.

DARIN-Armstrong, Inc. of Detroit has purchased a McKiernan-Terry diesel pile hammer (model DE-40). The new pile hammer is now being broken in on the new James Couzens expressway in Detroit, and was purchased from the R. G. Moeller Co.

BLUE Water Excavating Co. of Pt. Huron, Mich. has accepted delivery on a Hough model H-70 Payloader (2½-yd. cap.) powered by a JN-6-BI Cummins diesel from Hough distributor, Wolverine Tractor & Equipment Co.

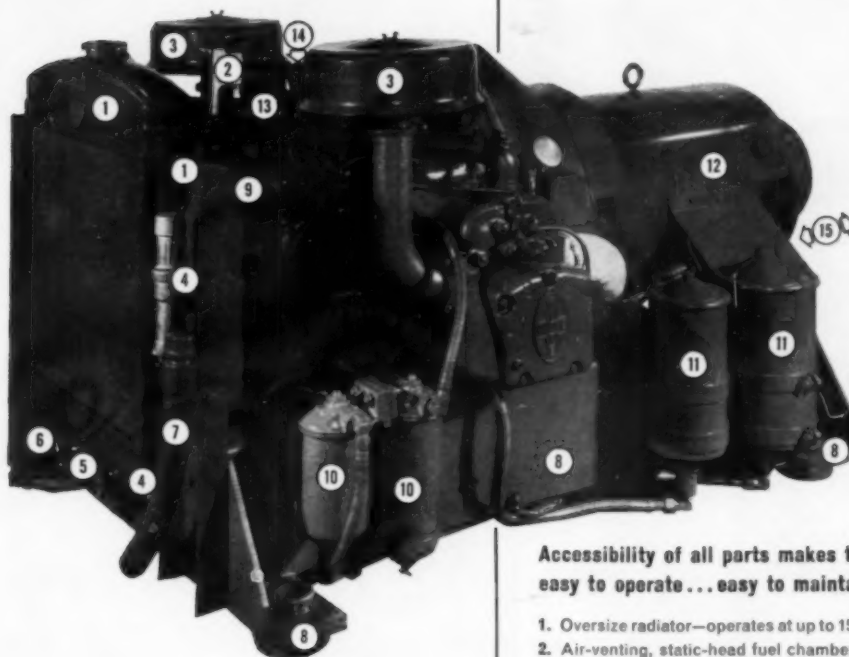
AN Allis Chalmers model 21000 diesel (300 hp, 844 cu. in. displacement) was purchased by Jack Weber of Pontiac for use in a gravel plant operation. Engine was supplied by Earle Equipment Co.

UTILITY Excavating Co. of Royal Oak, Mich. has accepted delivery on a Hough H-90 (2¾-yd.) powered by a Cummins C-175 engine. Sale was made by Wolverine Tractor & Equipment Co.

A 2¼ yd. Michigan tractor shovel powered by a GM 4-71 engine was delivered to the City of Midland (Michigan). Sale was by Miller Equipment Co.

DIESEL AND GAS ENGINE PROGRESS

Witte Diesel Engine-Generator Units are Built Low, Time-Tested and Packed with Endurance



Especially built for demanding refrigeration service, the Witte Models 100RDA, 12½ KW, and 120RDA, 17½ KW Diesel Engine-Generator Units have 60 cycle-40 cycle brushless generators and Witte two-cylinder, horizontally opposed, 4 cycle Diesel Engines.

The Railway Mechanical Refrigeration Industry is relatively new . . . yet Witte has been active as a power supplier in the field for over five years. Repeat orders from users attest to built-in quality and reliable performance. These fine railroad units are backed by a world-known organization.

Witte . . . noted for long-lived, continuous-running engines . . . is continually proving the capability of these railway units in mechanical refrigeration applications—where only a "live" engine is an acceptable one.

USS and Witte are registered trademarks

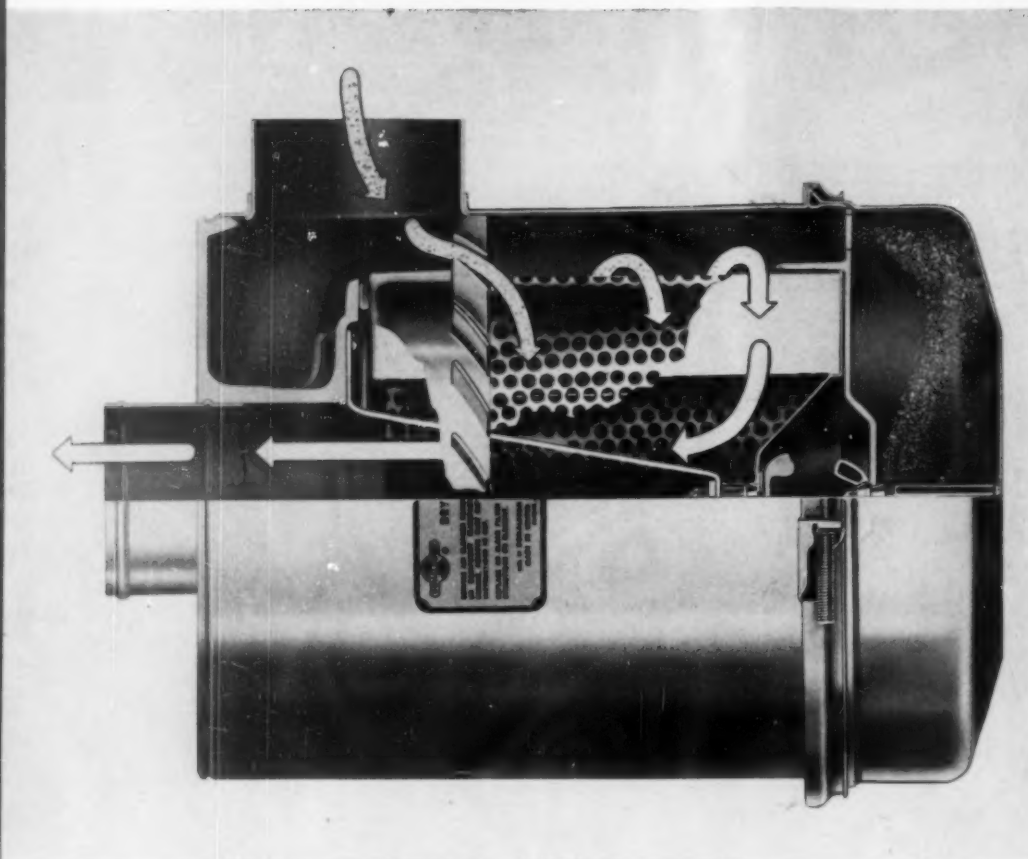
**Witte Engine Works
Oil Well Supply
Division of
United States Steel**



1615 Oakland Avenue Kansas City 26, Missouri

Accessibility of all parts makes the Witte easy to operate . . . easy to maintain.

1. Oversize radiator—operates at up to 150°F. ambient.
 2. Air-venting, static-head fuel chamber built into injection pump—eliminates shutdown from air leaks in car's fuel system.
 3. Dry type air cleaners—quickly and easily serviced.
 4. Ether injection system—for cold starting.
 5. Starting control (one lever provides all starting functions).
 6. Stop control.
 7. Extra length, lube-oil, dump hose—completely drains sump.
 8. Extra-heavy, rigid, skid-support with oversize shock mounts.
 9. Two-speed engine control (1800 rpm—"pull-down" speed) for maximum fuel economy (1200 rpm—"holding" speed) Thermostat actuated.
 10. Primary and secondary fuel filters.
 11. Bypass, Full Flow lube oil filters—1200 hr. change period.
 12. 12½ KW and 17½ KW (continuous ratings) brushless generators—operate at 60 cycles ("pull-down") 40 cycles ("holding").
 13. Mechanical, safety shutdown—built into injection pump.
 14. Load Compensator Switch—extends the functioning of the mechanical safety control to meet abnormal, transient temperature conditions.
 15. Center-of-Mass of the Witte unit is less than 16 inches off the car floor—optimum installation to handle car humps, shocks and over-the-road vibration.
- All accessories are readily accessible.



FWA Cyclopac air cleaner installed on a large highway truck.

Cutaway shows air flow through Cyclopac cleaner. Fins on element impart rotation to incoming air to separate large portion of dust, which flows to baffle, right.

PRE-CLEANER BOOSTS AIR FILTER LIFE

THE FW series of dry type air cleaners, latest in Donaldson's line for diesels, combines a pre-cleaner with a high efficiency filter for maximum element life. The "Cyclopac FW" series cleaners employ a centrifugal pre-cleaning in the primary stage and Donaldson's Duralife paper filter in the

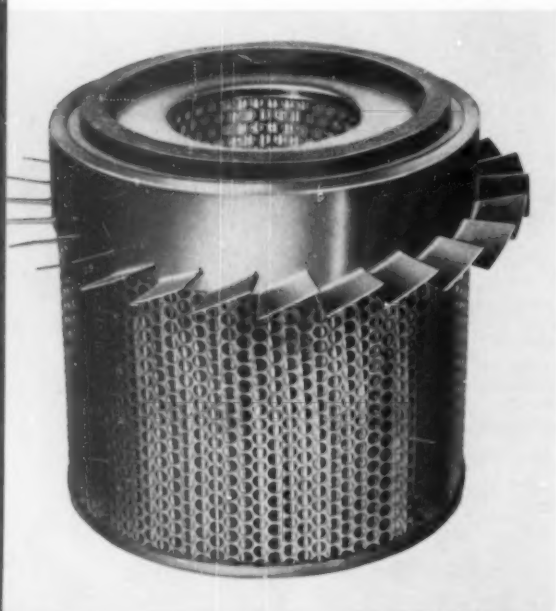
final stage, a combination aimed at long service life and 99.9% dust removal. These filters are designed for applications where dust conditions are not severe.

The Cyclopac's pre-cleaning system employs a series of plastic fins circling the outer diameter of the filter cartridge. These fins give high speed rotation to incoming air and the centrifugal rotation separates a large portion of the dust from the air. Dust removed by the centrifugal pre-cleaning is swept through a slot in the baffle and collected in a dust cup which can be easily removed for cleaning. Location of the baffle is determined by the mounting position of the cleaner, which performs equally well in the horizontal or vertical position.

Dust remaining in the intake air after primary cleaning is removed by the Duralife paper filter element. This element is chemically treated and oven-cured for resistance to oil and water. When service is required it can be renewed by back-flowing with compressed air or by washing in water and non-foaming detergent. This feature

can multiply the useable life of the filter and cut maintenance costs considerably, according to Donaldson.

The FW series of air cleaners are available in a wide range of sizes for applications in either horizontal or vertical mounting. FWA models for vertical mounting are made in units for air flow ratings from 280 to 1000 cfm. These FWA units are also available in models which can be mounted horizontally. FWG units, which can be mounted either horizontally or vertically, are made in models with air flow ratings ranging from 90 to 1050 cfm.

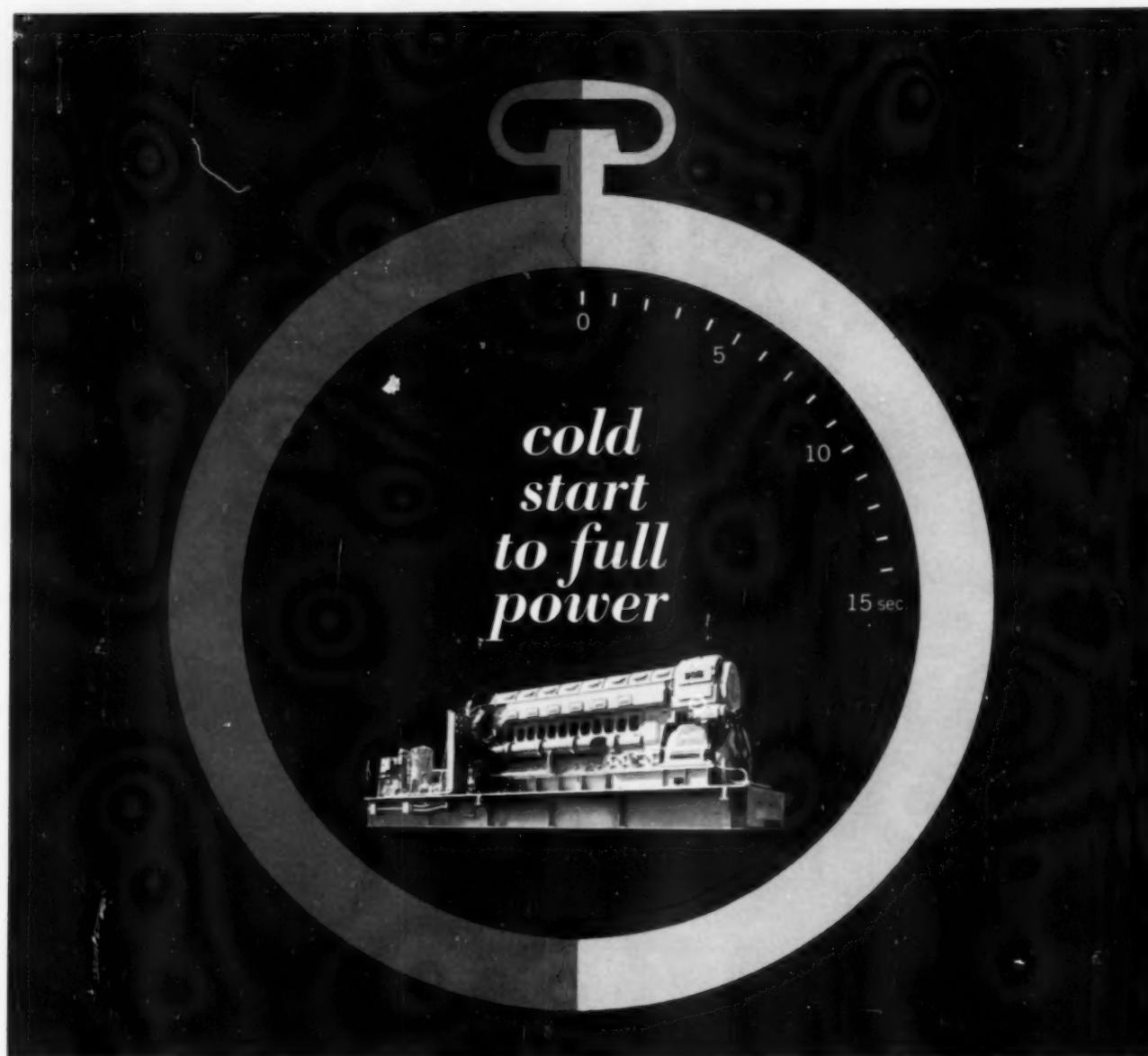


The plastic fins, the element and filter gasket are a single replacement assembly.

FWG model cleaner, here mounted horizontally on a power unit, can also be mounted vertically.



DIESEL AND GAS ENGINE PROGRESS



...15 seconds with Fairbanks-Morse Diesels

The F-M 38D8 $\frac{1}{2}$ Opposed-Piston Diesel Generating Unit—with only 15 seconds *from cold start to full power*—gives fast, sure power for peaking or for standby use, together with impressive operating economies.

This unit requires no spinning reserve . . . uses no power until it starts, then produces up to 2500 kw per unit. Can be linked in multiple units.

Dependable? Service records of F-M Diesels prove dependability beyond a doubt (F-M pioneered the manufacture of diesels in America . . . has kept in the forefront ever since.)

Economical? The 38D8 $\frac{1}{2}$ has 40% fewer moving parts than comparable engines of equal horsepower. This means reduced maintenance costs . . . fuel and lube oil savings.

Opposed-piston design minimizes vibration, produces fine balance . . . smooth power and instant response that result in 15 second full-power operation. Available with 4, 5, 6, 8, 10 or 12 cylinders, ranging from 450 to 2500 kw per unit, with automatic or manual controls. For full details or custom specifications, write today to: S. K. Howard; Director of Marketing; Fairbanks, Morse & Co.; Beloit Division; Beloit, Wisconsin.

FAIRBANKS MORSE
A MAJOR INDUSTRIAL COMPONENT OF
FAIRBANKS WHITNEY

Gulf Coast Power Notes

By Elton Sterrett

LAS Vegas Electric Co., Clovis, New Mexico, has taken delivery of a Stewart & Stevenson model 6GD-108C generator set powered by a General Motors

series 71, 6-cylinder diesel, which will be installed in Clovis Memorial Hospital as emergency stand-by.

ST. MARY's Hospital, Port Arthur, Tex., will power a 75 kw emergency generator with a model 10000 Allis Chalmers diesel furnished by Applied Power Equipment & Manufacturing Co., Inc., Houston.

COMMANDANT, Marine Corps, Washington, D. C., has ordered from Stewart & Stevenson Services, Inc., 100 four-kw generator sets, each driven by a single-cylinder American Marc diesel.

PETE's Fishing Camp, Hitchcock, Tex., has bought from Stewart & Stevenson Services, Inc., a General Motors series 53, 4-cylinder diesel marine engine,

equipped with an Allison 1½:1 hydraulic r&r gear.

JARDIN-Waugh (Singapore) Ltd., Singapore, has ordered from Stewart & Stevenson Services, Inc., 11 vertical V-8 General Motors diesels with special gearing to drive dewatering and slurry pumps in a tin mining operation.

BROWN & Root, Inc., Houston, has purchased from Zagst, Inc., Houston, two 150 kw generator sets, each powered by a Caterpillar model G342 engine.

J. E. Sutterfield, La Porte, Tex., has powered his towboat with a matched pair of General Motors 12V-71 diesels, each equipped with a 4:1 reduction and reversing gear. The engines were sold by Stewart & Stevenson Services, Inc.

DRILLING Accessories Manufacturing Co., Dallas, Tex., has obtained a series 53, 4-cylinder enclosed General Motors diesel power unit from Stewart & Stevenson Services, Inc., Houston.

SOUTHLAND Drilling Co., San Antonio, Texas, is replacing a gasoline engine on its Alice, Tex., drilling rig with an Allis-Chalmers model G-149 unit, furnished by Applied Power Equipment & Manufacturing Co.

INDUSTRIAL Supply Company, Freer, Tex., has bought from Stewart & Stevenson Services, Inc., a 9 kw ac generator set powered by a single-cylinder Petter diesel.

WILLIAMS Co., Fort Worth, Tex., has taken delivery from Stewart & Stevenson Services, Inc. of a 60 barrels/minute sand-fluid blender, powered by two General Motors 4-cylinder series 71 diesels.

LYKES Bros. Steamship Lines, Houston, has bought four Allis-Chalmers 5000 lb. capacity lift trucks, each powered by an Allis-Chalmers model D-175, 4-cylinder diesel, rated at 50 maximum hp. Sale was made through the coöperation of Lift & Equipment Service, Inc., New Orleans, Louisiana, and Applied Power Equipment and Manufacturing Company, Inc.

EMPIRE Electric Co., Fort Worth, Tex., has bought for runway lighting service at Dyess Air Force Base, two Stewart & Stevenson model 12VGD-200 24/4160 volt 60 cycle 200 kw generating sets, each powered by a V-12 General Motors series 71 diesel.

M. N. Dannenbaum Co., Houston, has purchased from Stewart & Stevenson Services, Inc., a closed type General Motors diesel power unit, incorporating a



WIX
LABORATORY

L.R.H.

the new CW-750MS tests show marked superiority over any other filter in color of oil, particle retention and service life.

LH

WIX CW-750MS Lube Oil Filter Cartridge for Diesel Engines.

NEW FOR DIESELS WITH 750 FILTERS

Here's the filter Diesel men have been waiting for. More than four years of laboratory research and development, plus untold miles of highway test, prove that you no longer have to be content with dark and dirty oil. The new WIX CW-750-MS is unconditionally guaranteed to keep even the most heavy duty lubricating oils clean and clear . . . or your money back!

Filtration of today's oil presents a special challenge due to modern detergent additives, heavy duty schedules and close tolerance engines. In the preservation of essential properties of the oil and the positive elimination of all harmful contaminants, this WIX Cartridge is in a class all by itself—a premium filter at the regular price!

If you believe in Preventive Maintenance and are interested in a better filter, for your engine's sake ask your local WIX wholesaler for all the facts or write today for complete information and prices.



WIX CORPORATION • GASTONIA, N. C.

In Canada: Wix Corporation Ltd., Toronto
In New Zealand: Wix Corporation New Zealand Ltd., Auckland

model 6031-C, series 71, 6-cylinder engine.

BROWN & Root, Inc., Houston, has purchased from Zagst, Inc., Houston, a 300 kw ac generating set powered by a model G-397 Caterpillar engine.

BRANIFF International Airways, Dallas, has secured two Stewart & Stevenson model SPGD-490 90 KVA self-propelled ground power units, powered by 6V-71 General Motors diesels. The generators were furnished by Ideal Electric & Manufacturing Company, Mansfield, Ohio.

J. D. Nicholson Company, Houston, has purchased from Applied Power Equipment and Manufacturing Company, Inc., a model F-244 Continental diesel which will be used to drive a fire pump.

CENTRAL Texas Bus Lines, Inc., Waco, Tex., is powering two of its buses with 4-cylinder General Motors series 53 diesels secured from Stewart & Stevenson Services, Inc., of Houston.

FEDERAL Aviation Agency, Washington, D.C., has taken delivery of five Stewart & Stevenson 20 kw ac generating sets, each powered by two-cylinder series 71 General Motors diesels.

W. R. Simms, Pearland, Tex., has secured from Stewart & Stevenson Services, Inc., a series 53, 3-cylinder General Motors diesel power unit.

Perkins, Wankel Agreement

F. Perkins Ltd., of Peterborough, has signed an agreement to manufacture NSU Wankel engines under license in the United Kingdom. The agreement—reached with patent holders NSU Motorenwerke Aktiengesellschaft and Wankel G.m.b.h., both of West Germany—enables Perkins to manufacture petrol marine engines and diesel engines. A Perkins spokesman said the company plans to undertake extensive development work on these engines and it is unlikely that they will be marketed for some time.

New Stock Gear Line

Morse Chain Co. is offering a line of stock gears produced at their new Eberhardt-Denver plant. The gears are available for off-the-shelf delivery to distributors and customers according to announcement by John V. Moynes, vice president and general sales manager. These are to be 20° pressure angle gears, but will be priced competitively with 14½° gears. Design will be such that a Morse 20° pressure angle gear set will be interchangeable with a 14½° set, though single gears are not inter-

changeable, of course. Present plans call for gears in the 3 to 20 pitch range. Types to be produced are spur, bevel, miter sets (both straight and spiral), helical and worm and gear sets. Highest grade materials—high-carbon steel, alloy cast iron, nickel bronze (worm gears) will be used. Non-metallic spur gears will be offered for low-load, high-speed applications.

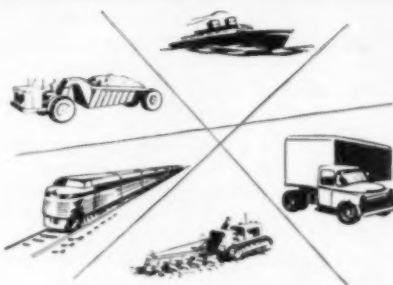
(ITS NEW)

Bendix Sales Engineer

Appointment of Emil V. Zecher as sales engineer in the New England Region for Bendix Corp.'s Filter Division has been announced. Mr. Zecher will work from offices in Boston and Hartford, Mass. He will handle all Bendix Filter Division products including fuel and air filters for agriculture and industry.

AVAILABLE NOW! The completely new 1961 edition of the **DIESEL AND GAS ENGINE CATALOG**, Volume 26, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 608 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover and costs just \$10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG**, 10850 Riverside Dr., North Hollywood, Calif.

Aeroquip Hose Lines and Couplings Add Dependability, Simplify Diesel Engine Maintenance



Truck or locomotive, construction or farm machinery . . . on every diesel application, Aeroquip Hose Lines save the user money because they last longer, cost less to replace.

Designed to highest quality standards, Aeroquip Hose Lines resist the effects of engine vibration and corrosion. They can always be counted on to provide dependable service.

Aeroquip Hose Lines simplify replacement problems. With a supply of bulk hose and reusable fittings, fluid lines are easily assembled, in shop or field, with simple hand tools. Always specify Aeroquip Hose Lines for your equipment.

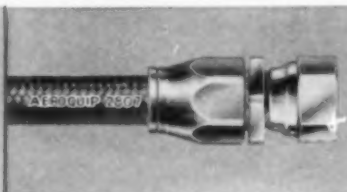
Engineering Assistance Available to Manufacturers of Diesel Equipment.



1503 Single Wire Braid Hose and Reusable Fittings are recommended for medium pressure hydraulic, lube and fuel oil, water and air lines up to 3000 psi. Sizes from ¼" to 3".



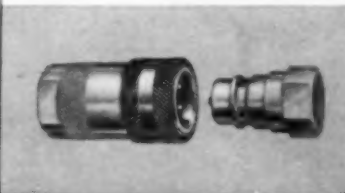
2601 Lightweight Single Wire Braid Hose and Reusable Fittings are recommended for engine fuel and lube systems up to 125 psi and for temperatures up to 300° F. Sizes from ¼" to 2".



2807 Teflon Hose and patented "super gem" Fittings are recommended for steam and compressor discharge lines. Sizes from ¼" to 1¼".



1525 Cotton Braid Hose and SOCKETLESS Fittings are recommended for oil, fuel, air, and gauge lines on engines and other applications up to 250 psi. Sizes from ¼" to ¾".




5600 PUSH-PULL Couplings for quick connection and disconnection of ½", ¾" and 1" hydraulic lines. Advanced valve sealing features long life, no leakage and protection from dirt.



MARMAN FLEXMASTER Pipe Couplings join pipe without threading or grooving. Full range of pipe sizes from ¾" to 4" for engine lube oil and hot water systems. FLEXMASTERS absorb engine vibration and minor deflection without leakage. MARMAN DIVISION.

SOCKETLESS, PUSH-PULL and FLEXMASTER are Aeroquip Trademarks
"super gem" is an Aeroquip Trademark. U.S. Patent Nos. 2,833,567 and 2,731,279

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AVAILABLE NOW! The completely new 1961 edition of the **DIESEL AND GAS ENGINE CATALOG**, Volume 26, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 608 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover and costs just \$10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG**, 10850 Riverside Dr., North Hollywood, Calif.

Applications Bulletin

A new bulletin, covering applications of the Superior model 40 diesel engines in shovels and draglines, has been issued by the White Diesel Engine Division. The four-cycle diesels are available in four models—six or eight cylinders, naturally aspirated or supercharged—conservatively rated from 385 to 800 bhp

continuous for OEM or repowering service. The bulletin describes construction features, including a number of recent design improvements, supercharging, and operation on non-premium fuels, amplified by cutaway drawings and photographs. Engineering data on dimensions, condensed specifications, and performance and fuel consumption charts are also supplied. Copies of Bul-

letin No. 125 may be obtained by writing to the Customer Service Department, White Diesel Engine Div., Springfield, Ohio.

ITS NEW

Expand Warehouses

Norma-Hoffmann Bearings Corp., Stamford, Conn., has completed the second expansion in less than a year at its Philadelphia and Atlanta warehouses. Capacity at the Philadelphia warehouse has been increased by 40 per cent. In Atlanta, a 50 per cent increase has been completed. Recent increases follow similar expansion put into effect at both warehouses last fall, Robert L. Miller, vice president in charge of sales reported. Like the earlier increases, the new moves are aimed at increasing the speed and service to a growing number of distributors and industrial users in the middle Atlantic states and in the southeast.

Clark Sales Engineers

Clark Bros. Co., announced appointment of the following men as sales engineers on Clark engines, compressors and gas turbines: M. S. "Mel" Kenady, Amarillo office. Mr. Kenady has been in sales engineering in the gas-petroleum industries since 1945. Z. B. Deer, Tulsa office—transferred from Amarillo after two years in sales engineering there. Mr. Deer was previously in supervisory work with Celanese Corporation of America. Edward S. Leonard, Houston office. Mr. Leonard has been in application engineering, sales engineering and marketing work at Clark headquarters in Olean, N.Y. for more than ten years. Thomas R. Bett, Shreveport, following four years as application engineer in that office and previous work in the Clark marketing section in Olean.

Retires as A-C Manager

Forty-four years association in the gasoline and diesel engine industry ended recently for Arthur F. Ochtman with his retirement as manager of Engine Engineering at the Harvey (Ill.) Works of the Allis-Chalmers Manufacturing Co. Mr. Ochtman entered the engine field in 1917 after completing his studies at Pratt Institute in Brooklyn, N. Y. After five years in Akron, Ohio, he came to Harvey, Ill., in 1922 to join the former Buda Company. When Allis-Chalmers acquired Buda in 1953, Ochtman was manager of engineering of its Engine Division. He continued with the company as manager of engine engineering, and during the past three years was in charge of this work at the company's new Engineering and Research Laboratory. Mr. Ochtman has played an important role in development of many of A-C's engines.

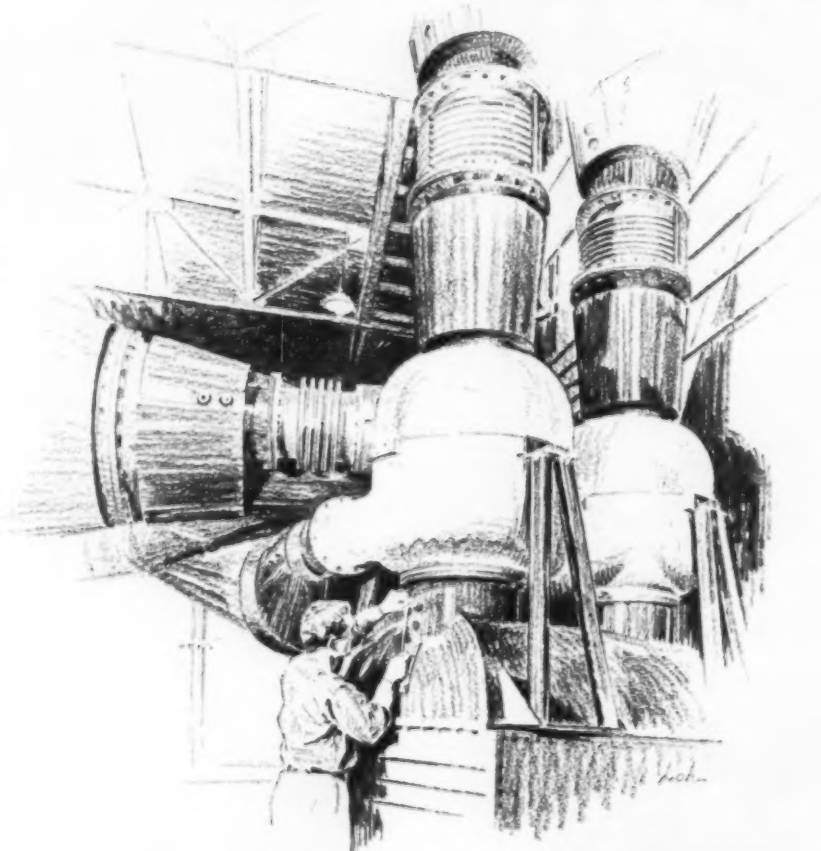
DE LAVAL

**vertically mounted
turbochargers
deliver top efficiency
for electric power plant**

Two De Laval turbochargers help a two-cycle Nordberg Diesel take the peaks at the Hudson, Massachusetts, municipal power plant with excellent low-load economy. The application versatility of these turbochargers permits vertical installation, helps produce this compact, efficient piping arrangement.

De Laval turbochargers — with the exclusive Monorotor design — offer highest efficiencies, a wide range of pressure ratios and increased output with reduced fuel consumption for both two-cycle and four-cycle engines.

De Laval Steam Turbine Company, Trenton 2, New Jersey



DE LAVAL • 60 YEARS OF CREATIVITY AND QUALITY

CENTRIFUGAL PUMPS AND COMPRESSORS • TURBINES • IMO® ROTARY PUMPS AND HYDRAULIC MOTORS
MARINE PROPULSION AND AUXILIARY EQUIPMENT • HELICAL AND EPICYCLIC GEARS • TURBOCHARGERS

REA Loans Report

Nearly half of the electric loans approved by the Rural Electrification Administration during 1960 were to finance facilities to generate and transmit more power in rural areas, the U. S. Department of Agriculture announced. Of a total of \$254.5 million in REA electric loans made in 1960, about \$120 million or 47.1 per cent went for generation and transmission purposes. In 1959, these loans accounted for 27 per cent of the total approved. The electric loans approved in 1960 brought the cumulative total of loans made in the 25½-year-old program to \$4,256 million. Funds advanced to the systems climbed to \$3,677 million. About 52.3 per cent of the 1960 loans will finance system improvements and new distribution facilities. The remaining 0.6 per cent will finance consumer facilities. Through the end of 1960, REA had approved about \$1,020 million in loans for generation and transmission purposes. The borrowers generated 4.7 billion kwh in 1960, an increase of 6.2 per cent over 1959. Excluding sales between borrowers, they purchased 26.4 billion kwh, surpassing 1959 by 9.7 per cent. Net sales reached 27.5 billion kwh, up 9.6 per cent over the previous year. Input of power on a net basis was 31.1 billion kwh, a 9.2 per cent increase over 1959. The average price per kilowatt hour to consumers dropped from an average of 2.39 cents per kwh for all types of consumers in 1959, to 2.31 cents in 1960. Cost of electricity to residential consumers, including farmers, dropped from an average of 2.57 cents per kwh in 1959 to 2.49 cents per kwh in 1960. In 1959, the average monthly residential bill was \$8.58; in 1960, \$8.95. Operating revenues rose 7.8 per cent in 1960, totaling an estimated \$665.9 million for the year. Net margins totaled as estimated \$88.8 million, an increase of 2.3 per cent over margins for 1959, after deductions for expenses, depreciation and interest.

Detail 1960 Progress

The story of developments in the Industries Divisions at Allis-Chalmers in 1960 is told in the recently released edition of "Engineering In Action." All phases of company activities are recounted in the graphically illustrated 36-page magazine. Included are those steps taken in the continuing search for improved operations, increased efficiency, better products, and reduced costs. Among the areas delved into—the latest research findings and developments including advanced work done on the fuel cell concept; a close look at progress made in procedures, facilities and equipment for power generation (including atomic power) and

transmission and distribution of power; and a recounting of some of the newly developed equipment A-C furnished for use in the metals and mining industry as well as in chemical and petroleum production, defense product needs, and general industrial applications. Copies are available by writing the company at Milwaukee, Wis.

ITS NEW

Canadian Napier Head

H. E. C. de Chassiron, managing director of D. Napier & Son Limited, London, England, has become president of the company's Canadian subsidiary, D. Napier & Son (Canada) Limited. He succeeds H. Sammons, who retired as managing director of this leading U. K. air-

craft, marine and industrial engineering enterprise, at the end of last year. de Chassiron, who was assistant to the general manager of the English Electric Company's Rugby, England, works prior to his present appointment, was previously U. K. national military representative at SHAPE, in Paris, and later, deputy director of manpower planning at the British War Office.

Great new things are coming from AMERICAN BOSCH!



SINGLE HYDRAULIC HEAD SERVES 8-CYLINDERS

NEW, SIMPLIFIED HEAVY-DUTY DESIGN

American Bosch PSJ Compact

Here's the new PSJ COMPACT, a heavy-duty fuel injection pump built for medium and large automotive diesels by American Bosch.

Equipped with a precision torque control governor, the PSJ COMPACT provides extremely accurate engine speed regulation under all loads and operating conditions. It is designed for all

types of engine combustion chambers... for 4, 6, and 8 cylinder engines... and will handle a wide variety of commercial fuels.

Latest addition to the American Bosch line of fuel injection pumps, the PSJ COMPACT offers championship performance at a lower price. Ask for complete information today.



AMERICAN BOSCH ARMA CORPORATION
Commercial Sales Division • Springfield, Massachusetts



Diesel Fuel Injection Systems



Ensign Carburetor



Hydraulic Cranking Systems and Accumulators



Automotive Electrical Equipment



Magneto and Ignition Equipment

Florida Diesel News

By Ed Dennis

THE Okeelanta Sugar Refinery Co. of Okeelanta installed a General Motors twin 6-71 diesel to power a Couch turbine (to lift) 54 in., 56000 gpm, 12 ft. head, water pump, for water control on their sugar plantation. The diesel is

rated 278 cont. hp at 1800 rpm; from Miami Br. Detroit Diesel Division.

THE FAA just put into operation their new IFS station west of Miami International Airport, for standby service. It has a Superior 40-S-8 diesel powering a Marathon, 550 kw, 830 amp, generator. Installation also includes a Woodward UG-8 governor and Perry water

filters. A similar installation is being put into operation at the Karachi Airport in Pakistan.

THE U. S. Sugar Corp. at Clewiston took delivery of an Ingersoll-Rand air compressor powered by a GM 4045 C (4-71) 82 hp at 2200 rpm. A similar installation went to Blanchard Machinery of North Miami.

NEAR Hialeah the C. T. Stockton Construction Co. is operating four No. 55 Pyscrapers. These are powered by HRB-600 Cummins diesels rated 172 hp at 1800 rpm; have Lipe Rollway clutches and Fuller 5C-720 transmissions.

UP near Sumterville the Quality Lime Products Corp. is using two model 95 Payhauler trucks powered by DT-817 International turbocharged six cylinder diesel engines rated 375 bhp at 2100 rpm in a rock quarry operation.

TWO model RT-4-M233 Deutz, two cycle four cylinder (250 bhp at 500 rpm) direct drive marine diesels provide propulsion for the 90 ft. *Terit II* currently in Miami.

EAST Ridge, a \$5 million retirement village development of the Lutheran Church, when completed south of Miami, will utilize a D343ATA Caterpillar 200 cont. kw standby generating set, supplied by Shelley Tractor & Equipment Co. of Miami.

OVER at Clearwater, Jim Robbins, took delivery of a 190-D Mercedes Benz four door sedan powered by a 55 hp Mercedes Benz diesel with Robert Bosch fuel injection system. He reports 450 mi. on a 15 gal. tank of #2 fuel oil.

SIMPLEX Sales of Hialeah engineered installation of two 15 kw Kohler generators (one ac, one dc) on the yacht *Glenmore*.

POWERED by a Cummins, model HRS-6-1 diesel with a 75 kva Electric Machinery generator for standby, FAA's new Miami Consol station out in the "Glades" will provide navigational guidance over a 1500 mi. range for ships or planes.

A Lister Blackstone diesel model SL-2 provides power for the newly installed Kohler 5 kw generating set on the yacht *Cutty Sark*; from Simplex Sales of Hialeah.

GULF Coast Engine Sales Inc. of Tampa repowered a stone crusher for W. L. Cobb with a model 16000 Allis-Chalmers diesel with Twin Disc power take-off. The diesel is rated 180 cont. hp at 1800 rpm.

BAHAMA Express, a 55 foot passenger vessel recently put into operation from Palm Beach to the islands, is powered by a pair of GM 12V-71 diesel engines with Allison 1.5:1 r & r gears. Top speed for the new vessel and its sister ship the *Bimini Express* is 23 knots.

GEORGE Reynolds was recently appointed a sales engineer with the Miami Br. of Detroit Diesel Div. of GMC. His background includes service with ElectroMotive Div., and his own company the R.P.M. Diesel Co. of Fort Lauderdale.

HENDRY Corp. of Tampa recently put into service their new 122 ft. all steel *Hendry #1* dredge and powered it with a 10 cylinder, 1800 hp Fairbanks-Morse O.P. diesel engine for the 20 inch Hendry rock pump.

SHELLEY Tractor & Equipment, Miami, supplied a model D311 Caterpillar diesel generating set with a Cat 30 kw 120/208 volt 1800 rpm 60 cycle 104 amp, generator for South Miami's City Hall.

ELLIS Diesel Sales & Service Inc., of Fort Lauderdale was appointed distributor for the Yanmar line of four, six and eight hp diesel engines for Dade and Broward Counties. These have American Bosch fuel systems and are assembled in California.

A TD-25 International crawler tractor with a 185 hp, turbocharged model D-817 diesel to Alonzo Cothron for road construction near Belle Glade. A TD-24 and a TD-6, plus four International Pyscrapers are also being used.

JACKSONVILLE Br. of Detroit Diesel supplied a GM 3-71 diesel, rated 72 hp at 1800 rpm, to power an anchor winch on a wood pulp barge owned by the Owens-Illinois Corp., Paper Products Div., for use in the Bahama Islands lumber industry.

Whitlock Chief Engineer

Gordon Bennett, president of The Whitlock Manufacturing Co., West Hartford, Conn., manufacturers of heat transfer equipment, announced the appointment of Alfred N. Major as chief engineer of the company. Mr. Major had been manager of the Thermal Design department since 1954.

Solar Sales Engineer

Robert M. Snow has been appointed turbomachinery sales engineer for Solar Aircraft Company in the Detroit, Michigan, area. Mr. Snow will handle sales activities for Solar's gas turbine engines and related turbomachinery for industrial and military users.

Clayton DYNAMOMETERS INSURE PEAK PERFORMANCE OF RYDER TRUCK RENTAL UNITS



RYDER LEASED TRUCKS "WEIGH-IN" REGULARLY TO CHECK PERFORMANCE

More than 17,000 truck units operated in over half the fifty states of the nation by Ryder Truck Rental are tested periodically by the Clayton Dynamometer. This determines if each unit is operating at peak performance under all conditions.

Ryder also uses the Clayton Dynamometer to test overhauled units under accurately simulated road driving conditions before being returned to service. After-service checks prove service workmanship... allow fine tuning to desired power ranges for maximum efficiency.

A COMPLETE LINE
Clayton Chassis Dynamometers are available in various single axle and twin axle models, with capacities from 150 to 800 rear wheel horsepower.

Clayton Chassis Dynamometer installation at 5-acre "model shop" operated in Miami, Florida, by Ryder Truck Rental for maintenance of 1100 vehicles in Miami District. The plant is a prototype for proposed Ryder shops in other cities.



After periodic engine overhauls, all Ryder Truck Rentals units are subjected to rigid indoor road tests on the Clayton Chassis Dynamometer to test engine under actual power load conditions before being restored to road service.

Clayton CHASSIS & ENGINE DYNAMOMETERS

CLAYTON MANUFACTURING COMPANY
443 N. Temple City Blvd., El Monte, California

312

Mid-West Diesel News

By L. H. Houck

BOONVILLE Sand & Gravel Co., Boonville, Ia., W-12 Case tractor with Case 451 diesel from Hawkeye Machinery Co., Boonville.

KOSTE Machinery Co., St. Louis, has delivered a Case W-3 backhoe and loader with 52 hp Case diesel to McCarthy Construction Co., St. Louis.

BIG DEAL . . . \$3.5 million driveway of 157 TD-15 International crawlers from IHC's tractor works. Destination Kansas City dealers and five other midwestern dealers.

BIG DEAL . . . Dalrymple Equipment Co., Amory, Miss., shipped \$1,190,000 worth of Allis-Chalmers construction equipment to various destinations on order of Stanley-Bledsoe Corp., a pipe line construction firm, Tulsa. Used 26 flat cars, 22 going to buyer's 217 mi. gas pipeline job near Marksville, La.

BIG DEAL . . . Union Pacific, Omaha, has purchased \$2,600,000 worth of locomotives—11 diesel-electric units. Four are from Alco Products, Inc., three from Electro-Motive Div. GM corp., and four from GE company. Alco units are 2400 hp model DL-640; EMD units 2400 hp SD-24 type and GE are 2500 hp U25B units only recently placed on the market. All units have 16 cylinder, turbo-charged diesel engines.

RYAN Equipment Co., St. Louis, has delivered an Allis-Chalmers HD6G tractor shovel with AC D-344 diesel engine to John Zehrer Construction Co., St. Louis county.

S. J. Groves Construction Co., Springfield, Ill., has taken delivery on a Ferguson self-propelled tamping roller with GM 4-71 diesel engine from Ryan Equipment Co., St. Louis.

INLAND GM Diesel, Inc., Milwaukee, has delivered two 6V-53 (185 hp at 2500 rpm) GM diesel truck engines to Rock County Highway Dept., at Janesville, for repowering Ford F-800 dump trucks.

TOWN of Lynne, Wis., has repowered an Austin-Western motor grader with a 4055C (4-71) from Aring Equipment Co., and Inland GM Diesel, Inc., Milwaukee.

EVENSON Bros., Valders, Wis., has taken delivery of an Allis-Chalmers 16000 diesel power unit for operating a Pioneer 35S crushing plant. Sale by Drott Tractor Co., Milwaukee.

STATE of Nebraska has purchased three 750 model Case tractors with Case diesels from Interstate Equipment Co., Lincoln.

MISSOURI State Highway Dept., Kirkwood, Mo., an Allis-Chalmers model D motor grader from Ryan Equipment Co., St. Louis.

KEN Woodruff Excavating Co., an Allis-Chalmers model HD6G tractor shovel with D-344 Allis-Chalmers diesel engine, from Ryan Equipment Co., St. Louis.

E. M. Chapman, Quincy, Ill., is a new Case 750 owner with a Case diesel.

GEORGE Jensen, Iowa Falls, Ia., a W-9 Case tractor with 301 Case diesel.

MARTIN Equipment Co., Roanoke, Ill., has delivered three Case model 750 tractors with 301 Case diesels to the state of Illinois.

ALLIS-Chalmers model HD6G tractor shovel with model D-344 diesel engine to Gerald Gonz, Cedar Hill, Mo., from Ryan Equipment Co., St. Louis.

DROTT Tractor Co., Milwaukee, has delivered a 21000 Allis-Chalmers torque converter power unit for use in upper Michigan mining operations to Cleveland Cliffs, Inc., Ishpeming, Mich.

INLAND GM Diesel, Inc., has delivered two 8V-71 GM marine diesels to Burger Boat Co., Manitowoc, Wis., for use in pleasure craft under construction.

CASE W-9, 4-wheel drive, with Case 301 diesel to Earl Weston, Lamont, Ia.

Navy, Army Contracts

The Navy has awarded a \$5.2 million contract to The Garrett Corporation's AiResearch Manufacturing Division, Phoenix, Ariz., for gas turbine compressors and power units. The mobile power packages are used for main engine starting, electrical servicing and air conditioning of aircraft. The Garrett Corp. was initially selected to manufacture the units on the basis of a design competition.

Garrett has also received a contract for a small gas turbine engine for the Army's new self-contained, mobile Mauler surface-to-air missile. The shaft power turbine package will be delivered to the Ordnance Division of Food Machinery and Chemical Corp. for installation on the tracked Mauler vehicle. It will undergo extensive road and environmental testing. The turbine power package weighs 479 pounds complete with gearbox, base, 45 kw—400 cycle generator and all controls.

Heads Webb Institute

Dr. William T. Alexander, dean of the College of Engineering at Northeastern University, has been named Administrator of the Webb Institute of Naval Architecture, Glen Cove, Long Island, New York, according to an announcement by the Webb trustees. A leading institution of higher learning devoted to the field of naval architecture, Webb Institute offers B. S. and M. S. degrees.

Technical Films Catalog

Modern Talking Picture Service has published a new guide to technical films for use by business, industry, and commercial and engineering colleges. More than 130 films dealing with specific technical subjects are offered on free loan for the asking in the catalog. The listing includes topics in the realm of the pure sciences as well as those affecting practical considerations of produc-

tion and distribution. Almost all basic American industries are represented by one or more films described in the catalog. The films are being offered free to adult groups connected with business or industry, or to study groups in business or engineering colleges. All are 16mm-sound films, from a quarter-hour to a half-hour in length. Films listed in the catalog will be available via 30 regional film libraries throughout the country. Copies of the catalog may be obtained by writing to Modern Talking Picture Service, 3 East 54th St., New York 22, N. Y.

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Koppers Research Center in Sommerville Park. Tall building in center houses all administrative offices, auditorium. At right are typical laboratory wings.

Research Facility Dedicated

Koppers newest and largest research facility, at Somervell Park, Monroeville, Pa., was dedicated on August 28. It represents an investment of approximately eight and one-half million dollars according to Fred C. Foy, chairman of the board. Koppers Company, Inc. a 49-year-old company with annual sales in excess of 300 million dollars, began to accelerate its research program about fifteen years ago when it moved into chemicals and plastics. Until that time the Company had been largely identified with engineering and construction—mostly in the steel industry; coal by-products, wood preserving, fabricated metal products and merchant coke plants. The company's Metal Products Division produces piston rings, couplings, fans and seals for the diesel industry. Only about one-third of the buildings planned

for the 176 acre site have been completed. No firm schedule for construction of the remaining buildings has yet been set.

The Center itself consists of a 5-story administration building, three 3-story interconnecting laboratory wings and several outlying auxiliary buildings.

New I-H Truck Series

Two new series of conventional, diesel-powered International trucks have been introduced by the motor truck division of International Harvester Co. Designated as 400 Series models, these new conventional-design units are offered in D-400 front-axle-forward or DB-400 set-back front axle design with gross combination weights up to 79,000 lbs. Eight highway or off-highway models are available, with single axle or tandem-axle drive, trailing or pusher axles and a broad range of standard and lightweight components. One design highlight of this new heavy-duty conventional series



is its one-piece reinforced fiberglass hood and front fender assembly which tilts forward 90° for easy accessibility to all front-end components. This one-piece, assembly eliminates separate fenders, fender braces, radiator shell and multiple-piece hood and results in a distinctively clean, functional front-end appearance. D-400 front-axle-forward models feature a 28-inch bumper-to-front-axle dimension for increased payloads in "bridge formula" areas. DB-400 models with set-back front axles have 48-inch bumper to axle dimensions, permitting increased payloads in "non-bridge formula" states. Standard diesel engine for all models is a 180-hp. in-line six. Nine optional engines are offered, including in-line six, V-6 or V-8 design. Horsepower ratings range up to 335. A direct-in-fifth transmission is standard and 26 other transmissions ranging from 4 to 12 speed are optional. A two-speed rear axle rated at 18,500 lbs. is standard for D and DB models. Tandem-drive bogie rated at 34,000 lbs. is standard for DF and DBF models.

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Elliott Marine Staff

The new marine sales department of Elliott Com-
pany, responsible for the sale of all shipboard
equipment, is presently staffed by two Elliott en-
gineers. James A. Mahan is located in the de-
partment's headquarters at 345 Investment Build-
ing, Washington, D. C., while Thomas H. Harris
will be located in the Elliott office at 292 Madison
Avenue, New York City. Mr. Mahan joined Elliott
in 1952. He was assigned to the Chicago district
in 1958 and was made assistant district manager
in early 1961. Mr. Harris joined Elliott's parent
company, Carrier Corporation, in 1955. Working
with Carrier as a compressor application engineer
for about three years, he joined the sales staff.



J. A. Mahan



T. H. Harris

specializing in industrial compressors and Navy
blowers. With the merger of Elliott and Carrier,
Mr. Harris became a compressor specialist in El-
liott's Eastern Region, a position he held until his
recent transfer to the new department.

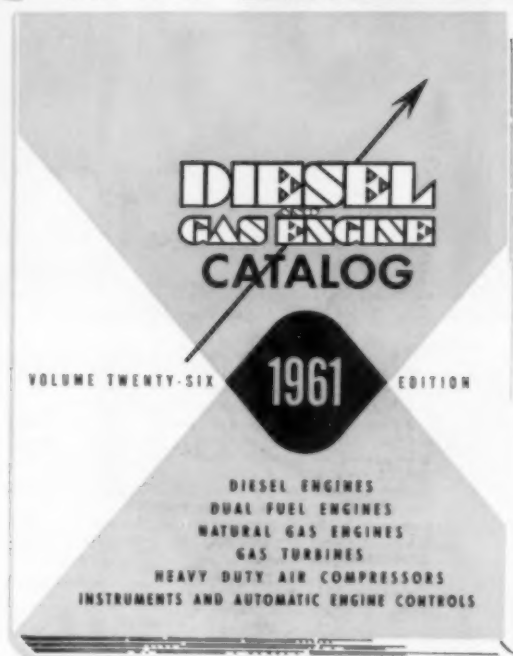
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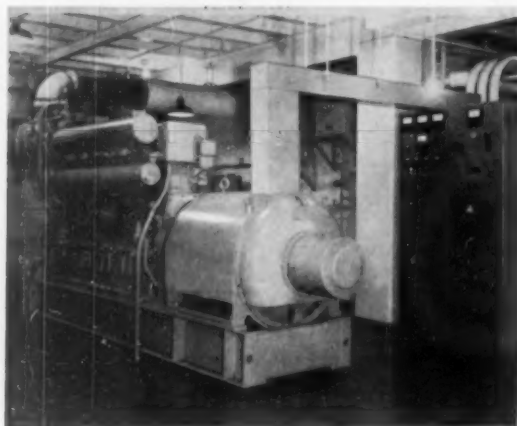
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V-Band Economies

A 16-page booklet entitled "economics of the V-Band Coupling" has recently been produced by the Marman Division of Aeroquip Corp. This booklet gives specific cost comparisons and discusses adaptability of design for manufacturers of filters, separators or containers. Bulletin SPD-2 is available from the Advertising Department, Marman Division, Aeroquip Corp., 11214 Exposition Blvd., Los Angeles, Calif.

New Air Compressor

Introduction of a new 30 hp air compressor delivering 141 cu. ft. of air per minute was reported recently by Atlas Copco. The machine is designed for heavy duty, three shift operations in power plants, chemical plants and other industrial locations as well as on construction jobs and in the mines. Designated the TT6, the new compressor is a two-stage, single acting unit featuring total air cooling. Company spokesman said this design facilitates the flow of lubricating oil and also eliminates condensation, aside from the obvious advantage of eliminating water. Equipped with an air-cooled intercooler, this machine is rated for working pressures up to 125 psi. Output of the TT6 is 115 cfm at 100 psi when running at 1170 rpm and 141 cfm at 100 psi at a speed of

1450 rpm. For further information write Atlas Copco, Inc., 545 Fifth Ave., New York 17, N. Y.

ITS NEW

Morse Engineering Promotions

Morse Chain Company has announced four major personnel appointments in the engineering department of the Ithaca, N. Y. plant. T. F. Sharpe, formerly assistant chief engineer and previously chief metallurgist and materials engineer for Morse, was appointed chief engineer of the Ithaca plant where he will be responsible for all engineering activities. He has been with Morse since 1952. Harold R. Fisher moves into the position of assistant chief engineer from his post as supervising research engineer in the Automotive Department of Borg-Warner's Roy C. Ingersoll Research Center in Des Plaines, Ill. He started in Borg-Warner's Central Research Laboratory in Bellwood, Illinois, and was transferred to the Product Development Laboratory in Detroit in 1954. Also from the Borg-Warner Research Center where he was supervisor of technical services, George A. Zimmer comes to Morse as director of research. He has been with Borg-Warner since 1954. Henry S. Germond, after three years as assistant chain products engineer at Morse, is now product development engineer.

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Lubricator Check Unit

The Lubricator Division of McCord Corp. announces the availability of the new A-29713 Lub-Sentry. Main purpose of this unit is to protect machinery against damage due to lack of oil in lubricator or mechanical failure of the drive mechanism. It gives added protection in the event of motor burnout where lubricators are electrically operated. The Lub-Sentry has particular application in power centers of industrial plants. When installed in the lubricator reservoir, it will sense any malfunction and either terminate operation of machinery, sound an alarm or light a signal. The device consists of a standard lubricator feed that circulates oil through a contained pressure valve. A relief valve that discharges at 100 p.s.i. allows oil to return to the reservoir. In the event of mechanical failure or lack of oil, the pressure will drop through a controlled orifice incorporated in the valve. For more information write John T. Davis, McCord Corp., E. Grand Blvd., at Riopelle, Detroit 11, Mich.

ITS NEW

Test Ground Support Pod

Flight testing of a new AiResearch ground support pod being delivered to the Navy has been successfully completed. Tests were held at the McDonnell Aircraft Co., St. Louis, employing an F4H aircraft. The torpedo shaped, 22-foot-long small gas turbine powered unit was designed for transport as external aircraft stores. Testing for the pod included level flight at varying altitudes to 40,000 ft., stalls, and 3-to-5G rolls and pull ups. Speeds through Mach 1 found only two narrow subsonic buffet zones, which presented no aircraft handling difficulties. Flights above Mach .96 were reported entirely smooth. The complete ground power package, which provides refrigeration, pressurization, starting and also electrical power for Navy aircraft, is built by The Garrett Corporation's AiResearch Manufacturing Division, Phoenix, Ariz.

Author Wins Prize

The author of a technical paper derived from 10 years research in locomotive wheel slip was honored with a \$1,000 prize at the recent X Pan American Railway Congress. John C. Aydelott of the General Electric locomotive and car equipment department, a fellow of the American Institute of Electric Engineers, received the award, which was sponsored by Alco Products, Inc. The paper, entitled "The Slippery Spot Concept of Wheel-to-Rail Adhesion and its implications with respect to Economical Locomotive Operation," was judged by the Congress as the best paper on the

construction, operation, and modernization of diesel-electric locomotives. Aydelott's thesis is that wheel slip is caused by slippery patches of rail, and therefore can be controlled by applying checks only when the locomotive is actually on one of the patches. Former theory held that the train weight must be limited to what the locomotive could handle on the worse section of track. The system concept by Aydelott allows the train weight to be increased to meet average conditions. This new approach significantly increases the amount of useful work the locomotive can accomplish.

New Dealerships

Two new Allis-Chalmers dealerships were announced recently. They include: Martin-Roosa Tractor & Equipment Co., Cedar Rapids, Iowa, has been appointed Allis-Chalmers engine dealer. The company, with its branch in Hannibal, Mo., will cover 76 counties in Iowa and eight in Missouri, selling and servicing Allis-Chalmers engine and power units, engine driven electric generating sets, products for the marine trade and for oil and gas field purposes. Frank L. Martin is president of the company. Ohio State Equipment, Inc., Columbus, Ohio, has been appointed engine dealer for Allis-Chalmers in 38 Ohio counties. The firm recently became an Allis-Chalmers material handling dealer covering 14 central Ohio counties, and has been serving the construction industry with Allis-Chalmers construction machinery in 26 counties of the state. Ohio State Equipment is headed by Stanley and Stephen Marks.

Hose, Drives Catalog

Manhattan Rubber Division of Raybestos-Manhattan, Inc., has issued a revised new condensed general catalog, describing the company's line of rubber products for industry. Included are sections on poly-V drive, V-belts, transmission belts, conveyor belts, and all types of hose, flexible rubber pipe and expansion joints, plus a summary of molded and extruded products. For copies of Catalog M5, write Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J.

ITS NEW

Motec Materials Engineer

David E. Thorn has been appointed materials engineer, Engineering & Research Division, Motec Industries, Inc. Thorn is responsible for selection, treatment and testing of all materials used in products of the firm's nine divisions, including farm, construction, materials handling and automotive equipment, power tools, as well as standard and exotic materials used in custom engineered, forge and foundry products.

Heads Capitol Office

Worthington Corp. announced promotion of William A. Meiter to the newly-created post of vice president—Washington services. Mr. Meiter, formerly vice president—employee & public relations, has been associated with Worthington since 1927. The primary function of the new Washington Services office will be to secure federal government business for the company's 15 operating divisions. Mr. Meiter will also have responsibility for the company's Washington district territory with offices at 15th & H Streets, N. W., Washington, D. C. Harold K. Beck, current manager of the office and a commercial vice president, will retire early next year.

New Office

Lake Shore, Inc. has established a new office for its contracting and parts division at 626 East Wisconsin Avenue, Milwaukee, Wis. The office will serve

southern Wisconsin and northern Illinois, including Chicago. The company's contracting and parts division is responsible for the manufacture and marketing of a complete line of base and surface plates, dynamometer bases, engine jacks and stands, automotive parts, and portable conveyors.

UP Buys Locomotives From Alco Products

The Union Pacific Railroad has purchased four 2400 hp, diesel-electric locomotives from Alco Products, Inc. The units will be the new Alco model DL-640 units, designed for high-speed, priority-freight service. Delivery to the railroad was made in August. Powered by a 16-cylinder, turbosupercharged diesel engine, the DL-640 locomotive has four traction motors, each delivering 600 horsepower of hauling power. Each of the new units weighs approximately 128 tons.



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Hercules Sale Completed

Stockholders of Hercules Motors Corp., Canton, Ohio, have approved provisions to sell assets of Hercules to Hupp Corp. Hercules thus became a wholly owned division of Hupp on Oct. 2nd when the transfer was completed. Under terms of the agreement 2½ shares of Hupp common stock was exchanged for each of the 345,000 shares of Hercules common stock. Approved by Hupp stockholders was not required. Hercules is a producer of diesel, gas, gasoline and liquefied petroleum gas engines for civilian and military markets. It has built more than 2 million engines since operations were begun in 1915. Hupp Corporation is engaged primarily in air conditioning, refrigeration, household appliances, heating and other thermodynamics products. It also manufactures aviation-missile, automotive and hydraulic products, architectural metals and pleasure boats. Hupp operates 14 plants in nine states and Canada.

White Engines Bulletin

Bulletin 1151—a four page "power digest" of all White Superior engines—has been issued by the White Diesel Engine Division of The White Motor Co. The bulletin reviews 26 models of six basic Superior engines, including the G-510, G-825, model 40, 60, 65, and the model 80 series. These engines span the horsepower range of 190-2150 bhp, with a choice of six or eight cylinders, naturally aspirated or supercharged, for low or medium speeds. Six of the 26

models are for gas operation, while the others may be run on diesel fuel, dual-fuel, or gas. A brief description and specifications of each engine are supplemented by references to other White Diesel literature giving more comprehensive coverage of individual models. Free copies of Bulletin 1151 are available from the Customer Service Dept., White Diesel Engine Div., Springfield, Ohio. **ITS NEW**

1-Million BHP for B&W

Burmeister & Wain and licensees in 1960 built large marine diesel engines with a total output of 1,018,000 bhp, corresponding to 27.99 per cent of the world production, according to B & W. A survey of the vessels in which these engines are installed shows that there are 138 vessels with B&W engines, corresponding to 24.86 per cent of the total number of ships put into service in 1960 (vessels of 2,000 tons dead-weight and over).

Chief Administrative Engineer

William S. Coleman, Jr., senior liaison engineer of the General Motors Research Laboratories, has been appointed chief administrative engineer at Motec Industries, Inc., Hopkins, Minn. Mr. Coleman will be responsible for engineering planning and properties, production coordination, prototype fabrication, experimental testing, technical services and budget control in the Engineering Research and Development Division.

Short Circuit Protection

Designed for overload of electrical and electronic devices such as rectifiers, relays, magnetic amplifiers and transistors, a subminiature cold-cathode trigger tube has been announced by Electronic Industries, Inc. The tube, designated WC-28, is used wherever a high pulse current of several hundred amperes lasting a few microseconds might damage or destroy an expensive device. The current flows through the thyatron, protecting the device.

The tube is rated from 350 to 3000 V dc on the anode, with a hold-off voltage of 3500 V dc. Peak cathode is from 10 to 1000 amp. For more information write Electronic Industries, Inc., 18 Marshall St., South Norwalk, Conn. **ITS NEW**

Deltics For Minesweepers

Napier Deltic diesel engines worth over £1,000,000 have been ordered by the Royal Australian Navy as replacement power plants for six of their 'Ton' class minesweepers. The ships are to be re-engined with Deltics as part of a modernization program to be carried out in British shipyards, starting mid 1961. They should be ready to be sailed back to Australia by R.A.N. crews by the summer of 1962. The deal involves three separate orders. Under the principal order each minesweeper will be equipped with two 18 cylinder, scavenger-blown Deltics as the main power plant, and one 9 cylinder Deltic as the power unit for an English Electric generator. The second order is for four spare Deltic 18's and two spare Deltic 9's, and the third is for approximately £100,000 worth of engine spares. These engines will be manufactured in the Liverpool Works of D. Napier and Son Limited.

Chain Drive Bulletin

Availability of a new bulletin featuring easy-to-follow chain drive selection procedures for its Rex stock industrial chain lines has been announced by Chain Belt Company, Milwaukee. The 12-page bulletin, no. 611P, includes new ARSCM horsepower ratings for A.S.A. Rex roller and Chabelco steel chains. Data in the bulletin's seven selection tables is arranged to provide quick determination of chain sizes, sprocket sizes, center distances, chain lengths, and the ranges of both A.S.A. Roller Chain Stock Sprockets and Chabelco Sprockets. A listing of stock drive equipment is also included.

For a copy of bulletin 611P write to the Sales Promotion Dept., Chain Belt Co., Milwaukee 1, Wis. **ITS NEW**

AVAILABLE NOW! The completely new 1961 edition of the **DIESEL AND GAS ENGINE CATALOG**, Volume 26, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 608 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover and costs just \$10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG**, 10850 Riverside Dr., North Hollywood, Calif.

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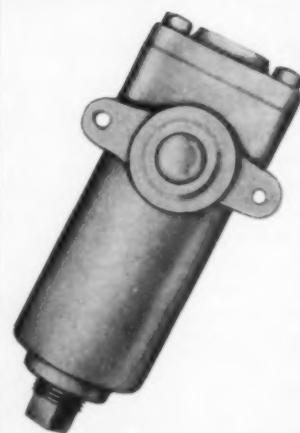
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Amot Model 2400 Indicating Relay tells which engine hazard caused shut-down, (whether low oil pressure, high water temperature or what).

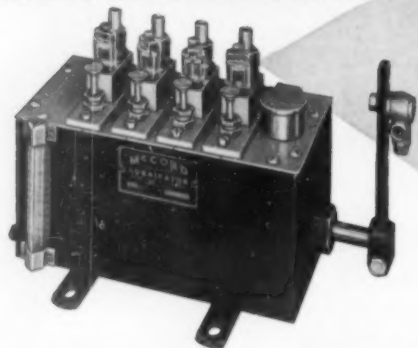
Uses air or gas pressure to function. One Relay used for each safety component in system.

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Expand Agency Staff

Davis Engineering Division of Tube Reducing Corporation, Wallington, N. J., manufacturers of heat transfer equipment, has announced the appointment of six new agents to handle local sales and application engineering. According to Richard L. Tannehill, vice president for sales, the new appointments are the result of increased interest nationally in the Davis line of "Paracoil" fuel oil heaters, heat exchangers and related types of oil and water coolers and heaters. Each of the new agents appointed will handle the complete "Paracoil" line and will have the additional assistance of the Davis factory engineering staff. The new agents are: R. W. Fowler & Associates, Inc. of Atlantic Beach, Fla. and Daphne, Ala.; R. E. Erickson Co., Boston, Mass.; and John Mac Eachern, Royal Oak, Mich. Also, George S. Bean, Minneapolis, Minn.; Barnard Equipment Co., Tulsa, Okla. and S. E. Burks Sales Co., Richmond, Va.

Conversion Factors Chart

A reference table for engineers and other executives in wall chart form has been published by Precision Equipment Co. This conversion chart is useful for engineers, shop men and other executives. Included are common conversions such as inches to centimeters or watts to hp as well as many conversions that are difficult to locate in reference manuals. For a free wall chart of conversion factors, write Precision Equipment Co., 4411 E Ravenswood Ave., Chicago 40, Ill.

Thread Sealer Compound

Armit Anti-Seize No. 609, is a compound consisting of suspended metallic lead and is formulated as a thread lubricant and sealer, hose connection and gasket sealant, for press fits and as cable lubricant. It is said to assure thread sealing under pressure or vibration and has Underwriter's Laboratories listing for propane, butane, and petroleum oils and hydraulic fluids. For more information write Aramite Laboratories, Los Angeles 1, Calif.

(ITS NEW)

A-C Engine Dealer

E. F. Craven Co., Greensboro, N. C., has been appointed Allis-Chalmers engine dealer for 19 counties in the western part of the state. It will sell and service engine and power units, engine-driven electric generating sets and products for the marine trade.

Joins Sales Staff

George M. Woodman has been appointed to the sales staff of the White Diesel Engine Division of The White Motor

Co. and has been named as one of the sales representatives in the firm's Houston office. Woodman will be responsible for the sale of White Superior compressors and gas engine-compressor sets to the petroleum, petrochemical, and industrial markets.

Multifuel Engine Filters

Purolator Products, Inc., has been awarded a contract for 12,000 filters to be used on a new multi-fuel engine intended primarily for military wheeled vehicles. The contract, amounting to \$154,000, covers the custom design and production of fuel and lubricating oil filters for a new engine developed jointly by Army Ordnance and Continental Motors. The new multifuel engine—which can operate on diesel fuels (Nos. 1 and 2), kerosene, JP-4 turbine fuel, and low and regular grades of gasoline—will provide the Armed Services with many benefits on problems of logistics and supply. Effective filtration for this variety of fuels is obtained by custom-designed filters incorporating two filter elements or media (the material which performs the actual filtration) in a single assembly, with each element independently sealed. Purolator Products engineers emphasized that the dual-element filter is a genuine two stage unit because it actually embodies two separate elements, with one medium providing positive protection in case the other is damaged. Both filters are designed to remove extremely fine particles.

Heads Customer Services

David Lavker has been named manager of customer services for Consolidated Diesel Electric Corp. Lavker will oversee the company's field service engineering, technical publications and spare parts operations for both its line of ground support equipment and its line of engine-driven generating equipment. He was previously a customer service representative for the company.

Expands Facilities

The Midland Sales and Service Offices and Parts Warehouse of Clark Bros. Co., Division of Dresser Industries, Inc., has been moved into new quarters at 1501 West Industrial Blvd., Midland, Tex. According to William A. Roever, Clark Dallas-Midland District Manager, the move was made to provide expanded facilities in all fields of service for users of Clark engines, compressors and gas turbines. The Midland Facility will headquarter Ben Stuart—sales engineer; D. E. Johnson—application engineer; A. J. Foster—parts salesman; and Billie Jo Hardin—district service manager.

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3 to 30 G.P.M.

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- other liquids



Fig. 199 Low Speed V-belt drive



Fig. 197 High Speed direct connected

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For additional information, ask for Bulletin SP-522D



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Multifuel Engine Brochure

The complete story of Detroit Diesel Engine Division's development of 12 multifuel engines capable of utilizing any fuel from diesel No. 2 to combat gasoline is told in a new brochure now available. Covered are models ranging from 20 to 650 hp, their wide range of

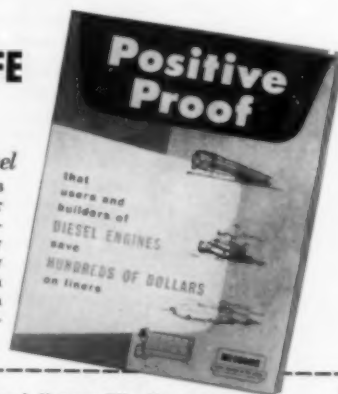
potential military applications and engineering details. Information relative to converting standard GM Diesel engines to multifuel operation is also included. The brochure can be obtained by writing Government Sales Section, Detroit Diesel Engine Division, General Motors Corp., 15400 W. Outer Dr., Detroit 28, Mich.

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